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Multi-System Biological Treatment

of Bleached Kraft Effluents

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MULTI-SYSTEM BIOLOGICAL TREATMENT OF BLEACHED KRAFT EFFLUENTS

by

The Mead Corporation
Chillicothe, Ohio 45601

for the

ENVIRONMENTAL PROTECTION AGENCY

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ABSTRACT

A multi-unit pilot plant of significant scale was used to study the biological treatment of integrated kraft pulp and paper wastewaters after conventional primary clarification. The biological units in the project included two high-rate trickling filters packed with PVC media, an oxidation ditch with brush-type aeration, and an earthen lagoon with mechanical surface aeration.

Many alternates were possible because the main feed could be excluded from one or more biological units and, in its place, any of the pilot unit effluents except the aerated lagoon could be pumped back to the main weir box for feed. Simultaneous series and parallel operation of the four biological systems was thus possible. The combinations using normal strength wastewater included:

a) Trickling filters in series
b) Trickling filter to aerated lagoon
c) Oxidation ditch to aerated lagoon
d) Oxidation ditch to trickling filter.

Black liquor was added to the clarified effluent on a continuous basis for a limited period of time in order to elevate the BOD_5 level from approximately 200 mg/l to approximately 500 mg/l and the following combinations were tested:

a) Trickling filter to oxidation ditch to trickling filter
b) Trickling filter to aerated lagoon
c) Trickling filters in series followed by oxidation ditch.

Best efficiencies at normal effluent strength were obtained on the pilot oxidation ditch when run with clarification and sludge return as the extended aeration process. BOD_5 removals as high as 94 percent were possible.

The trickling filter with sludge recycle performed slightly better than the conventional trickling filter. BOD_5 removals of 60 to 70 percent were possible.

The conventional aerated lagoon at short detention times was improved by clarification of the treated effluent. BOD_5 removals of 80 percent were possible.

Much information is presented on the pilot unit performances; many of the data have been mathematically modeled. Also presented are results from support studies which included nutrient testing, velocities within the aeration basins and many others.

This report is submitted in fulfillment of Grant No. WPRD-55 (12040 EMY) between the Federal Water Quality Administration and The Mead Corporation.

Key Words: Trickling Filters, Aerated Lagoon, Oxidation Ditch, Sludge Return, BOD Removal, Pulp and Paper Industry.

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W72-06846

MULTI-SYSTEM BIOLOGICAL TREATMENT OF BLEACHED KRAFT EFFLUENTS,

~~Author~~

The Mead Corporation, Chillicothe, Ohio

EPA ~~Pollution Control~~ Program ~~No.~~ 12040 EMY -- 12/71

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Two high rate trickling filters packed with PVC media, an oxidation ditch with brush type aeration, and an earthen lagoon with mechanical surface aeration, were piped to allow them to be run in various combinations as multi-stage pilot scale treatment units for treatment of integrated kraft pulp and paper primary effluent. The combinations operated on normal strength wastewater included: (1) trickling filter in series (TF); (2) TF to aerated lagoon (AL); (3) oxidation ditch (OD) to AL; and (4) OD to TF. Elevation of the BOD_5 from approximately 200 to 500 mg/l was accomplished by the addition of black liquor to the clarified effluent and the following combinations were tested: (1) TF to OD to TF; (2) TF to AL; and (3) TF in series followed by OD. Operation of the OD with clarification and sludge return produced as high as 94% BOD removals, the highest of any of the systems tested. The trickling filter with recycle performed slightly better than conventional trickling filters, reducing the BOD by 60 to 70%. 80% BOD_5 removals were accomplished through short detention aerated lagoon treatment followed by clarification. Modeling of both the individual and combined treatment system was accomplished, but with only limited applicability due to lack of sufficient additional data. (Lowry-Texas)

*Pulp ~~and paper industry~~, *Sulfite liquors, *Pilot plants, Sampling, Monitoring, Trickling filters, Oxidation lagoons, Oxygenation, Mathematical models, Data processing, Industrial wastes, Sludge, Biochemical oxygen demand, *Waste water treatment

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SECTION I SUMMARY OF RESULTS AND CONCLUSIONS

The most significant findings of this project pertain to reductions of biochemical oxygen demand (BOD) in the kraft pulp and paper mill effluent which was studied. This same effluent was dosed to a higher BOD level in several test series for a comparison with treatment of normal strength effluent. The BOD reductions which were accomplished by trickling filtration, the aerated lagoon, and the oxidation ditch process both in parallel operation and in combinations will be presented in this SUMMARY. Additional detail and results from support studies are presented in subsequent SECTIONS and may be used for other conclusions in answer to specific questions or situations.

Trickling Filter Treatment of Kraft Effluent After Primary Clarification

The high-rate plastic-media trickling filter with 1:1 recycle and nutrient addition is shown to be capable of consistently removing 60 to 70 percent of the applied BOD_5 at hydraulic loading rates up to 4000 gallons per day per square foot and organic loading rates as high as 140 pounds of BOD_5 per day per 1000 cubic feet of media volume at temperatures generally above 25°C. Additional detail on test conditions and loading rates are found in SECTION IV of this report.

With nutrient addition but no recycle, the removal efficiency drops to less than 50 percent at similar and higher loading rates.

The recycle of sludge back to the trickling filter does not adversely affect the treatment operation and may provide a satisfactory method for significantly reducing the excess sludge which must be handled after biological treatment. In addition, significantly less nutrients are consumed when sludge is recycled. No advantage was taken of this finding during this project.

Aerated Lagoon Treatment of Kraft Effluent After Primary Clarification

The conventional aerated lagoon with nutrient addition and without secondary clarification is shown to produce a variable treatment efficiency ranging from 35 to 80 percent for detention times of 1.5 to 3.8 days at temperatures ranging from 16 to 30°C. Test conditions and loading rates are detailed in SECTION V of this report.

Secondary clarification of these same aerated lagoon effluents is shown to produce a fairly consistent treatment efficiency at or above 80 percent BOD_5 removal.

Oxidation Ditch Treatment of Kraft Effluent After Primary Clarification

The oxidation ditch with nutrient addition when operated as an extended aeration process (i.e., with clarification and total sludge return) is shown to produce high treatment efficiencies. At one-day detention,

treatment efficiencies ranged from 68 to 86 percent BOD_5 removal. At two-day detention, the efficiencies ranged from 80 to as high as 94 percent. Temperatures ranged from 16 to 30°C. Test conditions and loading rates are detailed in SECTION VI of this report.

Since excess sludge was not wasted on a routine basis, such operation of the oxidation ditch may provide a satisfactory method for significantly reducing the problems of secondary sludge disposal which do occur with other high-efficiency biological systems. Nutrient consumption with such operation was the lowest of any system studied in this project.

Combination Treatment of Kraft Effluent After Primary Clarification

Five different combinations of the biological treatment processes were tested in 7 separate tests. The test conditions and loading rates are detailed in SECTION VII of this report. The following general results were found.

A roughing trickling filter preceding the conventional aerated lagoon improves the overall BOD_5 removal by 5 percent over that obtained by the aerated lagoon alone.

A polishing trickling filter following the oxidation ditch process improves the overall BOD_5 removal by less than one percent over that obtained by the oxidation ditch process alone.

The two trickling filters in series improve the overall BOD_5 removal by 20 percent on the average over that obtained by a single trickling filter.

The aerated lagoon was not able to reduce the BOD_5 concentration fed from the oxidation ditch process although some improvement should result if the final lagoon is allowed to reach equilibrium. The need for aeration in such a lagoon is doubted.

Treatment of Black Liquor-Dosed Kraft Effluent

The regular kraft effluent from the primary clarifier was dosed with black liquor to produce BOD_5 levels above 500 mg/l contrasted to 200 mg/l in the regular effluent used in the previous tests. A total of 3 individual tests and 5 combination tests were run with the following findings.

The high-rate plastic-media trickling filter with filtrate recycle is shown to be capable of removing 42 percent of the applied BOD_5 at an organic loading of 620 pounds of BOD_5 per day per 1000 cubic feet of media.

With no recycle, the removal efficiency on the black liquor-dosed feed drops to less than 15 percent at an organic loading of 1070 pounds of BOD_5 per day per 1000 cubic feet.

The conventional aerated lagoon without secondary clarification is shown to produce a treatment efficiency of 81 percent for a detention time of 7 days at a temperature of 23°C. Clarification of this effluent does not significantly improve the treatment efficiency as was the case at shorter detention times. The carryover of solids in the lagoon effluent is therefore seen to be a function of detention time in the lagoon.

A roughing trickling filter preceding the conventional aerated lagoon improves the overall BOD_5 removal by 6 percent over that obtained by the aerated lagoon alone at 1.8 days detention.

A single roughing trickling filter preceding the oxidation ditch process does not significantly improve the overall BOD_5 removal over that obtained by the oxidation ditch process alone.

A polishing trickling filter following the roughing trickling filter-oxidation ditch combination does not further improve the BOD_5 removal.

Two trickling filters in series preceding the oxidation ditch process do improve the overall BOD_5 removal by 14 percent over that obtained by the oxidation ditch process alone.

The two trickling filters in series improve the overall BOD_5 removal by 14 percent over that obtained by the first trickling filter alone.

Chemical and Power Needs for Treatment

Nitrogen and phosphorus are required as nutrients to achieve the BOD reductions detailed above. Using bulk prices for ammonia and phosphoric acid nutrient sources, the average chemical cost at 100:5:1 BOD:N:P feed ratio is approximately 0.4 cents per pound of applied BOD_5. A lower nutrient feed rate should be adequate but was not attempted in this project. SECTION VIII of this report details the measured consumption rate of nutrients in each of the biological treatment units for each test series.

Power consumption of the turbine and brush type surface aerators is a function of aerator submergence. SECTION VIII also details the net power input per 1000 gallons of aeration basin capacity and the resulting degree of mixing and the BOD_5 removal rates at various power inputs.

Best Treatment Results

TABLE 1 (page xiii) contains a summary of the best treatment results obtainable during this project. Each test is identified by unit process abbreviation as follows:

TF1 for Trickling Filter with Sludge Recycle
TF2 for Trickling Filter with Filtrate Recycle
AL for Aerated Lagoon
OD for Oxidation Ditch
CL2 for Clarifier 2 normally used with OD

The test number follows the unit process so that OD-8 means Oxidation Ditch Test Number 8; or TF2-1 means Test Number 1 on Trickling Filter with Filtrate Recycle.

This symbolism is being introduced now for the benefit of the reader who may venture beyond the RECOMMENDATIONS of this report to learn the actual test conditions and study the detailed test results.

SUMMARY OF BEST PILOT TREATMENT BOD_5 RESULTS
(Mead-FWQA Project on Biological Treatment)

Treatment Identification	Overall BOD_5 Removal	Treated Effluent BOD_5 (mg/1)
SINGLE PROCESS TREATMENT OF CLARIFIED KRAFT EFFLUENT		
OD-7 with CL2	93.7%	12
OD-8 with CL2	89.8%	19
OD-6 with CL2	86.6%	29
AL-10	84.2%	35
AL-6	81.9%	38
AL-5	82.3%	39
OD-5 with CL2	81.4%	39
TF1-4	79.5%	43
TF1-15	72.8%	46
OD-3 with CL2	80.0%	46
AL-7	76.1%	49
TF1-11	68.6%	62
TF1-1	67.5%	73
TF2-5	63.1%	74
OD-4 with CL2	64.7%	77
TF2-7	65.4%	79
TF1-5	60.0%	80
SINGLE PROCESS TREATMENT OF BLACK LIQUOR-DOSED EFFLUENT		
AL-13	83.3%	104
TF2-18	42.1%	366
(Note: TF1 and OD were not operated as separate processes during black liquor studies.)		
COMBINATION TREATMENT OF CLARIFIED KRAFT EFFLUENT		
OD-8 with CL2 to TF2-15	90.4%	16
TF1-14 to TF2-14	84.7%	31
TF1-16 to AL-11	85.8%	40
TF1-11 to TF2-11	70.7%	58
TF2-13 to TF1-13	63.8%	87
COMBINATION TREATMENT OF BLACK LIQUOR-DOSED EFFLUENT		
TF2-18 to TF1-18 to OD-10 with CL2	89.5%	65
TF2-17 to OD-9 with CL2	85.6%	88
TF2-17 to AL-12	74.1%	146
TF2-18 to TF1-18	56.9%	273

NOTE: All test conditions and loading parameters can be found in TABLE 3 (page 12) and are detailed in subsequent report SECTIONS. All BOD values were obtained from settled samples. The settling was accomplished in the field for OD and TF1. Imhoff cones were used for TF2 and AL to simulate field settling.

TABLE 1

SECTION II RECOMMENDATIONS

Recommended Use of Project Results

Utilization of the many findings of this project could be difficult without a guide of some type. Therefore the following guide is offered:

1. The relative efficiencies found in the work of this project for the several treatment processes under study should hold for any given effluent having characteristics similar to the effluent used in this project.

2. All absolute findings on BOD_5 removal pertain to the treatment of a specific integrated kraft pulp and paper effluent after primary clarification or this same effluent after being dosed to a higher BOD_5 concentration by the addition of kraft black liquor.

3. The removal of BOD_5 when black liquor was not being added can be predicted for the project wastewater by any of the specific treatment unit models contained in TABLE 2 (page xvi). The "constraints" and "range of values" are basic to these models and must be obeyed if the "constants" are to be meaningful.

4. For the similar treatment of effluents different from the project wastewater for which the models were developed, similar mathematical forms only with different constants would be expected. These constants would have to be developed on each specific wastewater by methods such as detailed by Eckenfelder and Ford (9).

5. The removal of BOD_5 when black liquor was being added cannot be predicted by the models in TABLE 2. Treatment of the project wastewater as dosed would have to be predicted on a comparative basis using those results actually obtained and which are presented in later SECTIONS of this report.

6. The removal of BOD_5 by combinations of the treatment processes in this project cannot be predicted by the models in TABLE 2. Rather, the same comparative basis with actual results would be necessary.

7. Those findings which pertain to mixing, basin hydraulics, and other support studies not dependent upon the effluent character are applicable to similar situations at other locations (see SECTION VIII).

Recommended Future Work

The general area of nutrient addition rates for biological treatment should be studied with the objective of controlling these rates to optimum levels. Further work should also be directed toward determining the extent to which the high efficiencies of the oxidation ditch process shown in this project could be accomplished in a short-term aerated lagoon with clarification and sludge return. Such a system, if found possible, could use existing or modified treatment facilities to enable high efficiencies at greatly reduced land requirements.

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TABLE 2

SUMMARY OF MATHEMATICAL MODELS FOR PILOT UNITS
(Mead-FWQA Project on Biological Treatment)

Unit:	TF1	TF2	AL	OD	
Model:	$S_e = \frac{S_a F}{1 + N\text{-}NF}$ where $F = \exp[-K\theta^{T-20} D/Q^n]$	$S_e = \frac{S_a F}{1 + N\text{-}NF}$ where $F = \exp[-K\theta^{T-20} D/Q^n]$	$S_e = \frac{S_o}{1 + k\theta^{T-20}_t}$	$S_e = \frac{S_o}{1 + k\theta^{T-20}_t}$	
Constraints:	A_v = 37 sf/cf 100% Sludge Return to top of Filter θ assumed = 1.035	A_v = 37 sf/cf No Sludge Return θ assumed = 1.035	No Sludge Return	100% Sludge Return Average F/M = 0.06	100% Sludge Return Average F/M = 0.3
Constants:	n = 1.2 K = 0.063	n = 1.2 K = 0.057	k = 1.424 θ = 1.023	k = 0.92 θ = 1.256	k = 3.37 θ = 1.063
Range of Values Used in Model Development:					
N Recycle Rate:	0 - 5	0 - 2	Not Applicable	Not Applicable	Not Applicable
Q (gpm/sf)	1.4 - 5.6	1.4 - 4.2	Not Applicable	Not Applicable	Not Applicable
D (feet)	22 - 24	16 - 24	6.7 - 7.7	4.0 - 8.6	5.2 - 7.0
t (days)	Not Applicable	Not Applicable	2.3 - 3.8	2	1
T (°C)	21 - 35	25 - 35	14 - 24	22 - 29	23 - 30
X_v (mg/l MLVSS)	Not Applicable	Not Applicable	114 - 528	1555 - 2848	613 - 1395
S_a (mg/l BOD_5)	169 - 295	193 - 295	206 - 222	185 - 209	215 - 229
S_o (mg/l BOD_5)	43 - 185	74 - 181	35 - 46	12 - 39	29 - 46
F/M	Not Applicable	Not Applicable	0.07 - 0.59	0.04 - 0.09	0.14 - 0.33

NOTES: Feed in all cases is integrated kraft pulp and paper effluent after primary treatment.
BOD values shown are settled values.

SECTION III

INTRODUCTION

Biological Treatment of Kraft Mill Effluents

The sulfate or "kraft" process now dominates the chemical pulping field. A total of 113 kraft mills in operation in the United States in 1969 produced 78 percent of all chemical pulp (13).

The kraft pulping process utilizes a cooking liquor mixture of sodium hydroxide, carbonate, sulfide, and sulfate (19) which allows a strong pulp to be produced from almost any wood species. The waste liquor can be put through a furnace for recovery of the sodium and sulfur compounds for material reuse and production of heat from the wood pulping waste products. Such a recovery process significantly reduces the potential for stream pollution. These factors make the kraft pulping process practical, economical and, therefore, widespread.

The National Council of the Paper Industry for Air and Stream Improvement has reviewed the status of effluent treatment in the U. S. segment of the industry and reports the following (13):

1. Approximately 49 percent of the U. S. kraft mills provide secondary treatment of some type.

2. 47 percent of these mills have installed storage oxidation basins (26 mills with 36 percent of total treated flow).

3. 31 percent have installed aerated stabilization basins (17 mills with 39 percent of total treated flow).

4. 16 percent have installed activated sludge (9 mills with 20 percent of total treated flow).

5. Less than 4 percent have trickling filters (2 mills with 2 percent of total treated flow).

6. One mill with 2.5 percent of the total treated flow has employed other means of secondary treatment.

It is concluded that secondary treatment in the kraft pulping industry means biological treatment of some type rather than chemical treatment. Whether this tendency changes in the future remains to be seen. However, the biodegradable characteristics of these process effluents do favor biological treatment.

Project Purpose and Need

The overall project objectives as stated in the revised application are:

1. To determine effect of influent solids and organics on biological process treatment efficiencies.

2. To evaluate potential of plastic trickling filters as:

   a. Main process for biological treatment
   b. Roughing filters prior to conventional aerated lagoons
   c. Roughing filters prior to and polishing filters after oxidation ditch utilizing the brush-type aerator.

3. To evaluate role of secondary clarification and sludge return in conjunction with biological methods described above.

4. To evaluate combinations of the methods of treatment discussed above in providing higher levels of organic and solids removals than are conventionally obtained. BOD removals up to 90 percent should be possible.

The need for such a project was brought about by the rising requirements for effluent treatment efficiency coupled with the fact that activated sludge processes, while capable of producing these high efficiencies, are also plagued with such undesirable traits as susceptibility to shock loads, close supervision requirements and high capital and operating costs. This project was directed toward studying the capabilities of other biological treatment processes, both singularly and in combination, in an attempt to find a satisfactory substitute for the expensive and difficult-to-operate conventional activated sludge process.

Award of Grant to The Mead Corporation

The need for such a project was outlined by The Mead Corporation to the Federal Water Quality Administration (FWQA, but previously FWPCA) in late 1966. Under the Water Quality Act of 1965 and the amendment by the Clean Water Restoration Act of 1966, Federal funds were made available for the first time to private companies and industries for research and demonstration programs designed to reduce the problems of water pollution. This project was granted in late 1966. The design and construction of the pilot plant were completed in early 1968. The actual field testing for the project was conducted in 4 phases spanning June 1968 to May 1970.

Three progress reports have already been submitted (1)(2)(3). The present report is the final report of the project and will present all findings to date, including those previously contained in the three progress reports.

SECTION IV

THE PILOT PROJECT

The Pilot Plant

FIGURE 1 (page 10) is an overall view of the pilot plant system as constructed and FIGURE 2 (page 11) is a schematic diagram showing the individual units which will be described below.

Pilot Trickling Filters (TF1 and TF2)

The trickling filters were two columns of plastic-type media in three 8-foot sections supported independently on a 4-story steel beam structure. Access stairs and walkways, media storage, flow splitting boxes and piping for other systems were also supported by this structure.

Each trickling filter media column was 24 feet high with a surface area of 16 square feet. The media was Koroseal Vinyl Pack (PVC) supplied by B. F. Goodrich. Each pack was 2 feet by 2 feet by 4 feet and weighed 34 pounds.

Trickling Filter 2 (TF2) was run at a media height of 16 feet for two tests, and Trickling Filter 1 (TF1) at 22 feet for two tests. All other tests were conducted at 24 feet due to the difficulty encountered in removing the growth-laden media.

The Trickling Filters were run in parallel and series, as roughing and polishing filters for the oxidation ditch, and as a roughing filter ahead of the aerated lagoon for a total of 18 separate tests on each filter.

TF1 recycled sludge, while TF2 recycled filter effluent in the conventional manner.

Recycle rates from 0:1 to 5:1 (recycle to feed) were tested on TF1. On TF2, rates of 0:1 to 2:1 were utilized. Hydraulic loadings as high as 8000 gallons per day per square foot were applied to TF1, while 6000 gpd/sf was the maximum applied to TF2.

TF2 was run ahead of the Rex clarifier during the initial stage of the project. Later, when this clarifier was used with the oxidation ditch, the filter effluent samples were settled in the laboratory as simulation of field clarification.

The two Trickling Filters as constructed were each a complete system and did not depend upon any other unit for independent operation except for the flow splitting box and main feed pumps.

Pilot Aerated Lagoon Unit (AL)

The Aerated Lagoon (AL) was a square earthen basin with rounded corners and sloping sides lined with 20 mil polyvinyl chloride (PVC). It had a steel truss bridge for walkway and support for the 3 horsepower turbine aerator supplied by Mixing Equipment Company. The aerator had a diameter of 29 inches and operated at 84 revolutions per minute.

The depth (and corresponding surface area and volume) was varied from 5 feet to 7.7 feet by means of an adjustable overflow dam. The volume increased from 88,500 gallons at 5 feet depth to 162,300 gallons at 7.7 feet depth.

Detention time was varied from 1.4 to 7.0 days by means of the flow splitting weir box provided.

Aerator power consumption was monitored by a 3-phase wattmeter. Power consumption was varied by adjusting submergence of the turbine at the aerator shaft or varying overflow height at the dam.

Lagoon velocities, flow direction and bottom sludge were monitored from the bridge using special equipment as discussed in PROCEDURES.

The lagoon was operated in series four times, once behind Trickling Filter 1, once behind Trickling Filter 2, and twice behind the Oxidation Ditch. In an additional nine tests, the lagoon was operated parallel to the other pilot units.

The lagoon was constructed as a complete system and did not depend on any other unit for its operation except the flow splitting box and main feed pumps.

Pilot Oxidation Ditch Unit (OD)

The Oxidation Ditch (OD) was an elongated oval basin with vertical sides of reinforced concrete and rounded ends of steel plate. A center column supported the flow baffles, mid feather and steel walkway. Massive concrete pillars supported the brush-type aerator. The major portion of construction was above ground, due to space limitations.

The OD unit was 11 feet high with a maximum liquid depth of 10 feet. Each foot of depth equalled 22,500 gallons volume. The surface area was a constant 3,005 square feet.

The 10 horsepower massive rotor aerator was supplied by Beloit Passavant. This brush-type aerator had a width of 66 inches and operated at 65 revolutions per minute.

The ditch depth (and corresponding volume) was varied from 4 feet to 8.6 feet by means of a standpipe and a unique flexible joint embedded in the bottom. Detention time was varied from 1 to 3 days utilizing the flow splitting weir box.

The ditch contents were overflowed in the channel downstream from the brush aerator. The feed was added in the channel upstream of the aerator. Either of the two functions could have been handled upstream of or downstream from the aerator.

Velocities and bottom sludge were monitored in the channel upstream, downstream and opposite the aerator, as discussed later.

Aerator power consumption was monitored by a 3-phase wattmeter. Brush submergence was kept constant during the project by utilizing the standpipe for adjustment.

In 3 tests the ditch was operated as an extended aeration activated sludge unit with sludge return from the Rex secondary clarifier. This sludge was added just upstream of the aerator close to the regular feed point. During part of these tests the ditch was run in series ahead of or behind the trickling filters and ahead of the aerated lagoon. The remaining two tests were without sludge return as in the aerated lagoon process.

The OD as constructed, was a complete system, and did not depend upon any other unit for its independent operation except for the flow splitting box and main feed pumps.

Pilot Clarifier Units (Clarifier 1 and Clarifier 2)

The clarifiers used were a rim flow with sludge arm, and a center feed with a cone bottom and center mixing. Both were of steel plate construction.

The rim flow unit (Clarifier 2) was 12 feet in diameter overall, with 11 feet comprising the settling zone. The height was 11.5 feet, giving a settling zone of 8150 gallons and a detention time greater than one hour for high design flows. The cone bottom unit (Clarifier 1) had a 15-foot overall diameter with a depth of 11.5 feet for a total volume of 9900 gallons. This volume represented three zones; mixing zone of 4975 gallons, settling zone of 3635 gallons, and a sludge zone of 1290 gallons.

The Rim Flow, Tow Bro Clarifier mechanism was supplied by Rex Chain Belt. The Rex unit was used with Trickling Filter 2 and the Oxidation Ditch. The cone bottom unit was used with Trickling Filter 1 exclusively.

The sludge withdrawal rate was varied as required by means of the unique pumping and piping system. Sludge was pumped back into the respective systems or wasted if necessary.

Pumps for Pilot System

Two main feed pumps and six smaller process pumps permitted the return of virtually any treated or untreated effluent to any pilot treatment system. Many independent and dependent flow systems were provided. The pumps were supplied by Goulds and Yeoman. The piping was plastic, PVC and black iron, while all valves were cast iron.

Electrical Power for Pilot System

550 volt, 3-phase electricity was supplied to the pilot site control center. Separate breakers and switches were provided for each of the two main feed pumps, each of the six process pumps, the Rex clarifier mechanism, the Mixco aerator and the Beloit brush. A transformer reduced the voltage to 110-220 volts for pilot area lighting, control center lighting and receptacles, and sampling station receptacles at each pilot unit.

Pilot Scale

The pilot systems for this project were built large enough to minimize the effect of pilot to full scale data extrapolation. Flow rates to the Trickling Filters ranged from 11 to 67 gpm (16,000 to 96,500 gpd). For the Aerated Lagoon, the flow rate was varied from 16 to 80 gpm (23,000 to 115,200 gpd). The Oxidation Ditch influent rates were varied from 31 to 109 gpm (45,000 to 157,000 gpd).

Project Plans

A total of 59 separate tests were run on the pilot units between June 10, 1968 and May 1, 1970. Each Trickling Filter had 18 separate tests, the Aerated Lagoon was tested 13 times, and the Oxidation Ditch had 10 tests completed.

TABLE 3 (page 12)shows the completed project plans for all systems with the independent variables identified and the test settings given.

In the second and fourth columns of this TABLE, the units and tests are identified by symbols as follows:

PF	for Pilot Feed (clarified mill effluent with nutrients added)
TF1	for Trickling Filter 1
TF2	for Trickling Filter 2
AL	for Aerated Lagoon
CL1	for Clarifier 1
CL2	for Clarifier 2

Tests are identified by unit and test number, as in TF1-1 for Test Number 1 on Trickling Filter 1.

Presentation of Data

All data were reviewed and edited with respect to validity of the individual BOD results and unusually large variation in the characteristics of the pilot unit feed. These edited data were then averaged over that time believed to represent acclimation at the test conditions. This acclimation period was taken consecutively and always included the last week of test results except where temperature or feed BOD extremes deviated greatly from previous weeks. Data results and analysis will be presented in subsequent SECTIONS of this report.

General Aspects of Mathematical Modeling

The term mathematical modeling as it applies to biological systems is the derivation of a mathematical expression which defines the treatment efficiency or effluent concentration to be anticipated from a particular biological system. It relates the various parameters which bear influence upon the anticipated removal or effluent. In general, a given biological system and its performance will be a function of the effluent being treated, the makeup of the biomass which is accomplishing this treatment, and other parameters such as detention time, temperature, and certain reaction rate constants. These constants take into account the relation between the particular effluent being treated and the biological system accomplishing this treatment.

Mathematical models may be expected to take one of several general forms. In the first, the BOD removal is a function of the influent BOD concentration, the detention time, the biological mass, temperature, and a reaction rate constant which is a combination of constants defining certain aspects of the biokinetics of the system as well as the susceptibility of the effluent being treated to these biokinetic processes. The second form is where the BOD remaining is a function of the detention time (the time of exposure), temperature, influent waste concentration and a reaction rate constant. The establishment of the particular relationship can be done through purely mathematical approaches or through certain graphical relationships. The latter method was used during the mathematical modeling of the data in this project.

It has been shown (9) that the mathematical model for completely mixed aerobic systems such as might be expected from the oxidation ditch process or the aerated lagoon generally takes the following form:

$$\frac{S_o - S_e}{S_e} = X_v tk$$

Previous work on trickling filters indicates a retardant form as follows (9):

$$\frac{S_e}{S_o} = \exp\,[-kA_v t]$$

The terms in the above equations are defined as follows:

S_o is the influent BOD concentration to the treatment unit (mg/l).

S_e is the effluent BOD concentration from the treatment unit (mg/l).

k is the biological rate constant.

X_v is the volatile suspended solids under contact in the system and is intended as an expression of the active biological mass (mg/l).

t is the detention time of the system (days).

A_v is the specific area of the filter media (sf/cf).

The influent and effluent concentrations in the above equations are generally expressed by filtered BOD values. However, the data to be reported here are based upon unfiltered but settled BOD values. It is anticipated that the resultant models will reflect this difference.

The term θ^{T-20} can be inserted in the above equations as the temperature correction which must be applied to the reaction rate constant k, where:

θ is the temperature coefficient.
T is the temperature (°C) of the biological process.

The value of θ then represents the rate at which the activity or biological rate constant is expected to change with temperature. The magnitude of this change will be dependent upon the type of system which exists. The more dispersed the discrete biological particles are, the more susceptible they can be expected to be to temperature variations because these temperature variations will influence the particular organism and its individual biokinetics. In the case of large flocculant particles, the temperature influence along biokinetic lines is secondary and the controlling influence is that of the diffusion or transfer of oxygen into the agglomerated floc particle. The large flocculant growth is less temperature dependent than the dispersed growth.

Therefore, for a well flocculating system, a low θ value might well be expected. For a dispersed system which could occur with extremely low or high food to microorganism (F/M) ratios, a reasonably large temperature rate constant could be expected to result. The biological reaction rate constant k may also be expected to change with feed type and composition as shown by Tishler (18).

The various mathematical models and the constants associated with them are presented in the following SECTIONS pertaining to the respective

biological systems. In addition to presenting the mathematical formula and the related constants, the observed effluent BOD concentrations and overall treatment efficiencies will be compared to those which would be predicted by the resultant models.

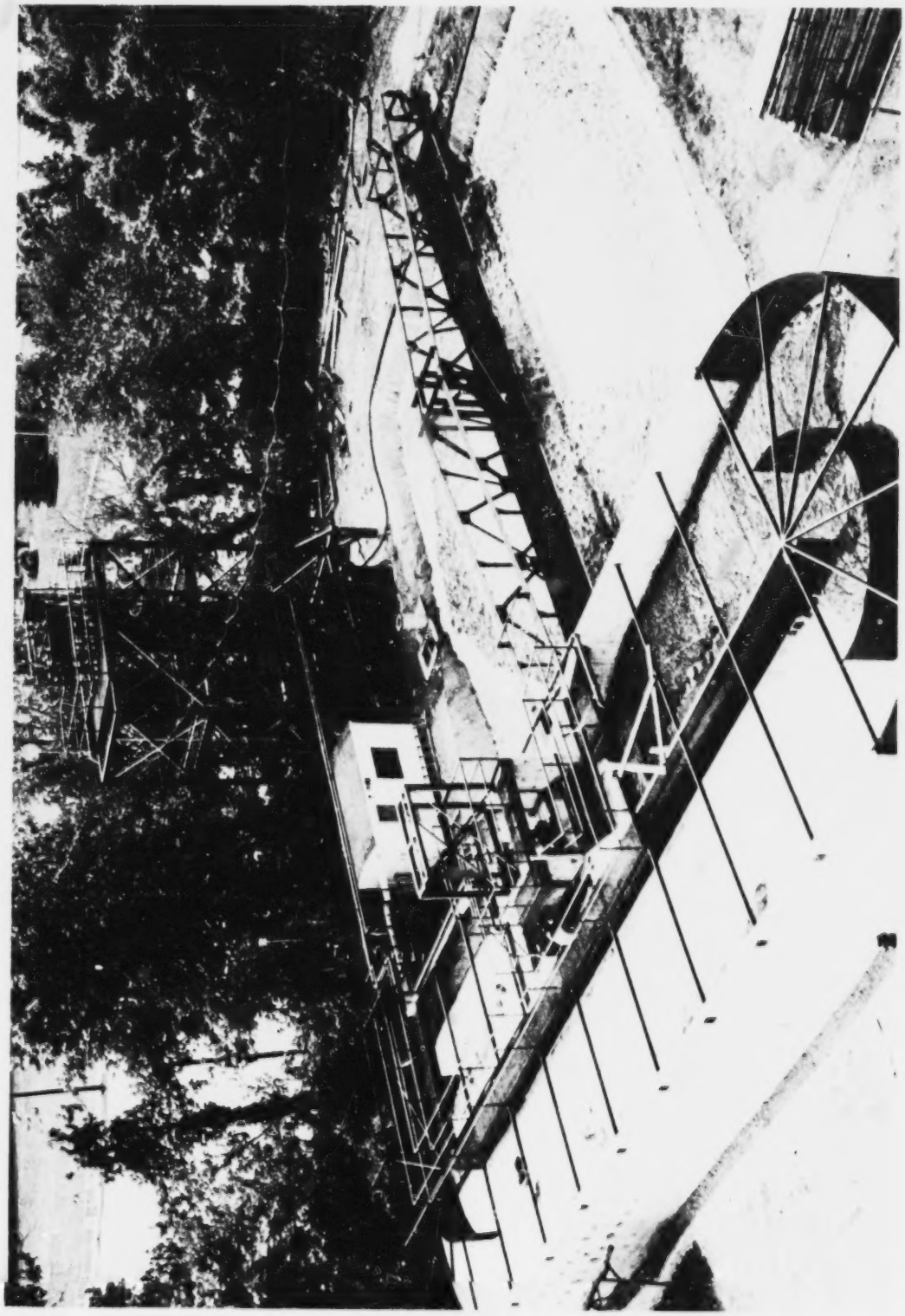

FIGURE 1

SCHEMATIC DIAGRAM OF PILOT TREATMENT PLANT
(Mead-FWQA Project on Biological Treatment)

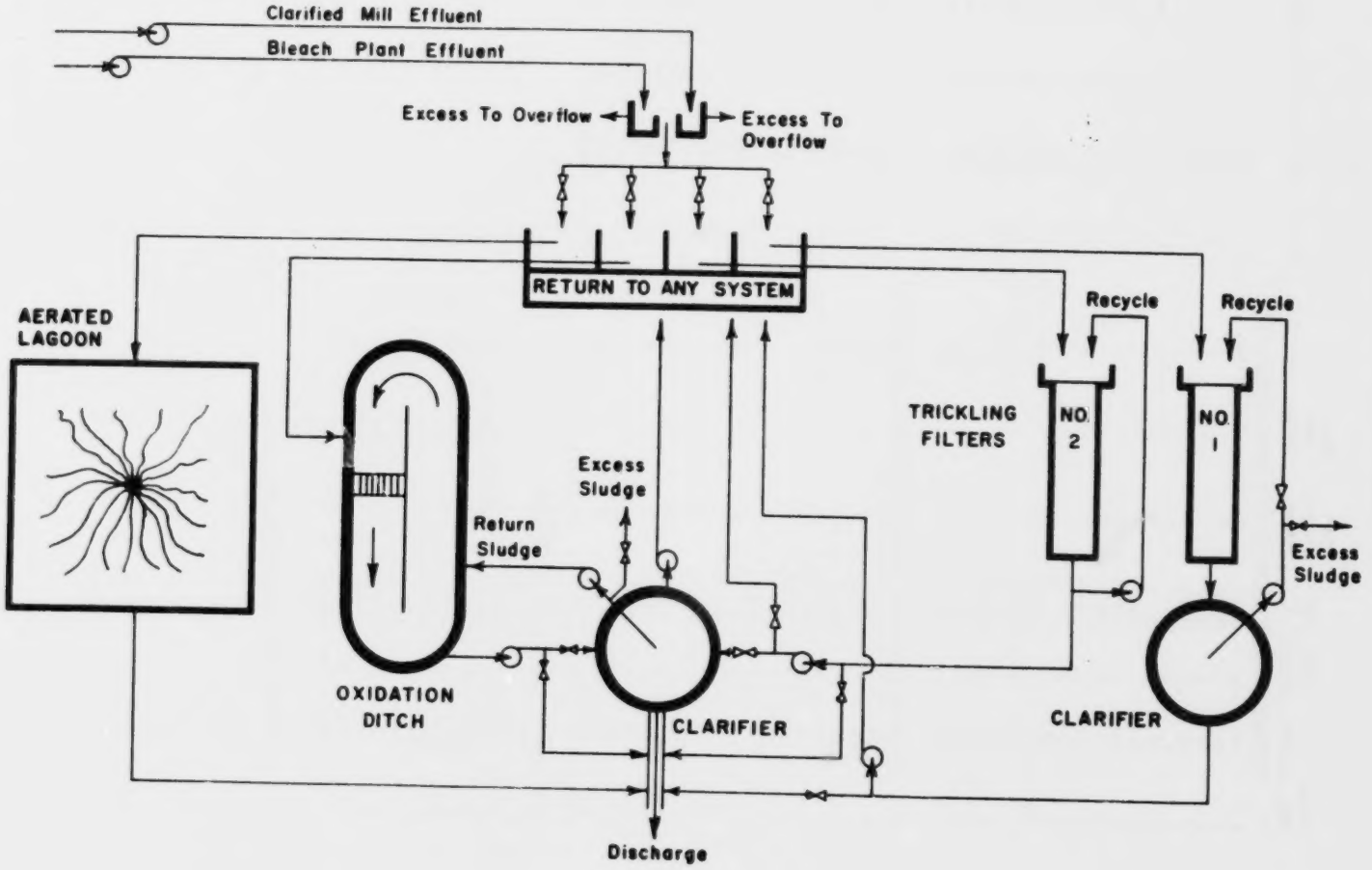

FIGURE 2

COMPLETED PROJECT PLANS FOR ALL SYSTEMS
(Mead-FWQA Project on Biological Treatment)

Alternate	Feed	Black Liquor	Test I.D.	Test Duration (weeks)	Deten. Time (days)	Clarif.	Recycle	Hydraulic Loading Rate (gpd/sf)	Depth or Height (ft.)	Dates Beginning	Dates Ending
I.	TRICKLING FILTER PILOT SYSTEM WITH SLUDGE RECYCLE (TF1)										
A	PF	no	TF1-1	7	-	yes	1:1	4000	24	6-10-68	7-28-68
A	PF		TF1-2	3	-		1:1	6000	24	7-29-68	8-18-68
A	PF		TF1-3	3	-		1:1	8000	24	8-19-68	9-8-68
A	PF		TF1-4	3	-		1:1	2000	24	9-9-68	10-6-68
A	PF		TF1-5	3	-		1:1	4000	24	10-7-68	10-27-68
A	PF		TF1-6	3	-		0:1	2660	22	10-28-68	11-17-68
A	PF		TF1-7	3	-		0:1	1330	22	11-18-68	12-6-68
A	PF		TF1-8	5	-		1:1	6000	24	2-3-69	3-9-69
A	PF		TF1-9	4	-		0.5:1	6000	24	3-10-69	4-6-69
A	PF		TF1-10	3	-		0.5:1	4000	24	4-14-69	5-4-69
F-1	PF		TF1-11	3	-		1:1	4000	24	5-5-69	5-25-69
A	PF		TF1-12	3	-		1:1	6000	24	5-26-69	6-15-69
F-2	TF2		TF1-13	3	-		1:1	4000	24	6-16-69	7-3-69
F-1	PF		TF1-14	7	-	Feed to Sump	1:1	4000	24	7-14-69	8-31-69
A	PF		TF1-15	6	-	yes	5:1	8000	24	9-1-69	10-12-69
B-1	PF		TF1-16	10	-	no	0:1	6000	24	10-13-69	12-19-69
C-2	OD	yes	TF1-17	9	-	yes	0:1	3000	24	1-5-70	3-8-70
F-2	TF2	yes	TF1-18	8	-	yes	1:1	6000	24	3-9-70	5-1-70
II.	TRICKLING FILTER PILOT SYSTEM WITH FILTRATE RECYCLE (TF2)										
A	PF	no	TF2-1	7	-	yes	1:1	4000	24	6-10-68	7-28-68
A	PF		TF2-2	3	-	yes	0:1	2000	24	7-29-68	8-18-68
A	PF		TF2-3	3	-	yes	0:1	4000	24	8-19-68	9-8-68
A	PF		TF2-4	3	-	Imhoff Cone	1:1	4000	16	9-9-68	10-6-68
A	PF		TF2-5	3	-		2:1	4000	16	10-7-68	10-27-68
A	PF		TF2-6	3	-		2:1	4000	24	10-28-68	11-17-68
A	PF		TF2-7	3	-		1:1	4000	24	11-18-68	12-6-68
A	PF		TF2-8	5	-		1:1	6000	24	2-3-69	3-9-69
A	PF		TF2-9	4	-		0.5:1	6000	24	3-10-69	4-6-69
A	PF		TF2-10	3	-		0.5:1	4000	24	4-14-69	5-4-69
F-1	TF1		TF2-11	3	-		1:1	4000	24	5-5-69	5-25-69
A	PF		TF2-12	3	-		1:1	6000	24	5-26-69	6-15-69
F-2	PF		TF2-13	3	-		1:1	4000	24	6-16-69	7-3-69
F-1	TF1		TF2-14	7	-		1:1	4000	24	7-14-69	8-31-69
D-2	OD		TF2-15	6	-		0:1	6000	24	9-1-69	10-12-69
A	PF		TF2-16	10	-		0:1	6000	24	10-13-69	12-19-69
B, C, G	PF	yes	TF2-17	9	-		0:1	6000	24	1-5-70	3-8-70
F-2,C-3	PF	yes	TF2-18	8	-		1:1	6000	24	3-9-70	5-1-70
III.	AERATED LAGOON PILOT SYSTEM (AL)										
A	PF	no	AL-1	7	2.3	no	no		6.7	6-10-68	7-28-68
A	PF		AL-2	6	1.5	no			6.7	7-29-68	9-8-68
A	PF		AL-3	6	3.0	no			6.7	9-9-68	10-20-68
A	PF		AL-4	7	2.3	no			6.7	10-21-68	12-6-68
A	PF		AL-5	8	3.8	Imhoff Cone			6.7	2-3-69	3-30-69
A	PF		AL-6	3	3.0				6.7	3-31-69	5-4-69
A	PF		AL-7	3	2.3				6.7	5-5-69	5-25-69
E	OD		AL-8	5	1.4				7.7	5-26-69	6-27-69
E	OD		AL-9	9	1.7				5.5	6-30-69	8-31-69
A	PF		AL-10	6	3.5				7.7	9-1-69	10-12-69
B-1	TF1		AL-11	10	1.7				5.5	10-13-69	12-19-69
B-2	TF2	yes	AL-12	9	1.8				5.0	1-5-70	3-8-70
A	PF	yes	AL-13	8	7.0				7.7	3-9-70	5-1-70
IV.	OXIDATION DITCH PILOT SYSTEM (OD)										
A	PF	no	OD-1	6	3	no	no		6.7	6-17-68	7-28-68
A	PF		OD-2	6	2	no	no		7.0	7-29-68	9-8-68
A	PF		OD-3	6	1	yes	yes		7.0	10-28-68	12-6-68
A	PF		OD-4	8	1				4.0	2-3-69	3-30-69
A	PF		OD-5	5	2				4.0	3-31-69	5-18-69
E	PF		OD-6	6	1				5.2	5-19-69	6-27-69
E	PF		OD-7	9	2				5.2	6-30-69	8-31-69
D-2	PF		OD-8	6	2				8.6	9-1-69	10-12-69
C-2	TF2	yes	OD-9	9	2				4.3	1-5-70	3-8-70
C-3	TF1	yes	OD-10	8	2				4.3	3-9-70	5-1-70

TABLE 3

SECTION V

THE PILOT PLANT FEED SOURCE

Location

This project involved the study of biological treatment on particular effluents from the integrated kraft pulping, bleaching, and papermaking operation of The Mead Corporation in Chillicothe, Ohio. This Mead manufacturing facility consists of a 600-ton per day hardwood kraft pulp mill with bleach plant and 15 papermachines with a total average production of more than 900 tons per day of fine papers.

Raw Water Characteristics

The main water supply of the Chillicothe Division is wells. Some water is also furnished by a well-point system and a surface water source.

Better than half of the raw water is passed through sand filters and chlorinated. This filtered water goes to the turbine rooms and part is used as process water. The rest of the raw water is softened with lime. A portion is treated with alum and activated silica for certain papermaking uses. The remainder is used in the bleach plant and the pulp mill.

The untreated water has the following average characteristics:

Total hardness	367 mg/l (as $CaCO_3$)
Calcium hardness	245 mg/l (as $CaCO_3$)
Total alkalinity (MO)	258 mg/l (as $CaCO_3$)
Iron concentration	2.1 mg/l (as Fe)

The softened water has the following average characteristics:

Total hardness	167 mg/l (as $CaCO_3$)
Calcium hardness	64 mg/l (as $CaCO_3$)
Total alkalinity (MO)	65 mg/l (as $CaCO_3$)
Alkalinity (P)	27 mg/l (as $CaCO_3$)

Character of Pilot Plant Feed

Process effluents from the Chillicothe Division are provided primary clarification and then secondary treatment in an aerated lagoon.

The main pilot plant feed source was mill primary clarifier effluent (called Pilot Feed or PF). During the course of the project, varying quantities of bleach plant effluent were being added either to the full

scale system by the Chillicothe Division or at the pilot site using a special pump to maintain a definite ratio. This bleach plant effluent comes from chlorine-caustic extract-hypochlorite-chlorine dioxide bleaching stages which are generally abbreviated as the CEHD bleaching sequence.

Nutrients were added at the pilot site to maintain a level of 100:5:1 BOD_5 to ammonia as nitrogen to phosphate as phosphorus. Variation of nutrient concentrations in the mill clarifier effluent are presented in SECTION VIII and summarized in TABLE 30 (page 105), also in that SECTION.

Four distinctly different Pilot Feeds can therefore be identified during the course of the project as shown in TABLE 4 (page 15). These categories will be identified by symbol in the later SECTIONS of this report.

The variation of physical and chemical characteristics is not detailed here but rather will be shown for each test period on each pilot unit.

IDENTIFICATION OF DIFFERENT PILOT FEEDS
(Mead-FWQA Project on Biological Treatment)

Symbol	Duration	Comments
PF(1)	6-10-68 to 11-17-68	Chillicothe Mill primary clarified effluent with no bleach plant effluent added.
PF(2)	11-18-68 to 6-10-69	Mill clarified effluent already mixed with partial bleach plant effluent in ratio of 5:1
PF(3)	6-16-69 to 12-19-69	Mill clarified effluent mixed at pilot site with bleach plant effluent in ratio of 4:1
PF(BL)	1-5-70 to 5-1-70	Mill clarified effluent already mixed with partial bleach plant effluent in ratio of 4:1 plus supplemental addition of black liquor blowdown to achieve higher BOD.

TABLE 4

SECTION VI

TRICKLING FILTER TREATMENT

The Trickling Filter Process

The trickling filter is the most common method being employed today for biological treatment of municipal wastewaters. For industrial wastewaters, however, the situation is different. Only two such treatment plants are operating in the kraft industry.

Biological filtration as occurs in a trickling filter is not a filtering or straining process as the name may imply. Rather it is a technique for promoting contact between the wastewater and an active growth of microorganisms which adhere to the filter media. The trickling filter is, therefore, a fixed bed reactor for biological treatment as opposed to the activated sludge process which constitutes a fluid bed reactor. More complete descriptions of the process may be found in the literature (5)(9)(12).

Many different types of media have been tried through the long history of trickling filters, but crushed stone or rock is considered by many to be the most acceptable material. However, within the last 10 to 15 years, plastic media have received increasing attention because of its ability to be constructed in tall columns and to be loaded at higher hydraulic and organic rates, all of which results in less land area required for treatment.

Standard-rate rock-media trickling filters are normally designed for loadings of 25 to 100 gallons per day per square foot of surface area (gpd/sf) and 5 to 25 pounds of BOD per day per 1000 cubic feet of media volume (ppd/1000 cf)(5). Trickling filters loaded at rates greater than the standard rates would be termed high-rate trickling filters. If a filter receives a BOD loading of over 100 ppd/1000 cf, then it is referred to as a roughing filter. The acceptable design loading capabilities of plastic-media trickling filters would place these filters in the high-rate category.

High-rate plastic-media trickling filters are more applicable for use in treatment of large volume industrial wastewaters than are conventional rock-media trickling filters because of resulting space and equipment requirements. This project was involved with operating two 24-foot pilot trickling filter towers packed with PVC-type plastic media. What follows is a summary of all results and an analysis of the high-rate trickling filter as the main process for biological treatment of kraft mill effluents. The results of combination treatment studies involving the trickling filters and either the oxidation ditch treatment process or the aerated lagoon treatment process will be presented in SECTION VII of this report.

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Project Results on Pilot Trickling Filter 1

Pilot Trickling Filter 1 (TF1) was unique in that the filter recycle was sludge underflow from the cone-bottomed clarifier which followed TF1. A mixing ring in the center of the clarifier was kept agitated, also by returned sludge, as it was fed the filter effluent. Oxygen was transferred to the wastewater in the trickling filter tower and remained as dissolved oxygen (D.O.) when the filter effluent contacted the sludge in the mixing ring. Although actual D.O. levels in this mixing ring averaged above 0.1 mg/l for most test series, D.O. readings of zero were encountered on occasion, which means aerobic biological activity would have been hindered in this mixing ring.

Clarification was accomplished outside the mixing ring with the settled sludge pumped from the cone bottom for recycle to the top of the filter and to the mixing ring. The volatile solids content of this recycled sludge varied from less than 0.1 percent to greater than 0.7 percent based on average test results during tests TF1-8 through 18 of the project. Earlier testing on this sludge was restricted to volumetric settleable solids which were found to range up to 950 ml per liter per 30 minutes (ml/l/30 minutes). A program of wasting of 50 to 100 gallons per day of this sludge was initiated in test TF1-9 by necessity since the pump, cone bottom, and distribution pan were all found to clog on occasion and interrupt the treatment operation on TF1. (See TABLE 41 in the APPENDIX (page 131) for details of the sludge wasting program on TF1.)

TF1 was constructed with sludge recycle in an attempt to oxidize the excess sludge that occurs from filter sloughing and also to derive benefit, if possible, from maintaining active sludge in contact with aerated trickling filter effluent.

A total of 18 pilot tests were conducted on TF1 during the project. Of these tests, 17 involved the cone-bottomed clarifier with sludge return to the mixing ring and sludge recycle to the top of the filter. The results of these 17 tests will be considered together. The remaining test (TF1-16) will be handled with Pilot Trickling Filter 2 results.

TF1 test conditions have been arrayed with respect to recycle ratio and hydraulic loading rate. The edited test results on BOD_5 efficiency of all tests are shown in this format in TABLE 5 (page 28). Detailed explanation of this TABLE may be useful since the format is used again.

In TABLE 5, each test period occupies a single row and the tests are not in numerical order because the results have been arrayed as stated above. To aid in interpretation, the whole first row will be identified. The test is shown as TF1-7 which means test period 7 on Trickling Filter 1. The test conditions for TF1-7 were: 0:1 recycle to feed ratio, which means no recycle to the top of the filter (1:1 recycle means equal amounts of recycle and feed applied to the top of the filter); 1330 gallons per day per square foot hydraulic loading including the recycle volume, if any; 22 feet of media packed in Trickling Filter 2 for this test; system

feed of PF(2) which was mill clarified effluent with partial bleach plant effluent in actual ratio of 5:1 according to TABLE 4 (page 15); and the organic loading rate counting only the influent BOD_5 strength was 90 pounds of BOD_5 per day per 1000 cubic feet of filter media volume. The edited test results for these conditions in TF1-7 were: an average temperature in TF1 effluent of 21°C; the BOD_5 removal efficiency of this unit in this test averaged 51.6 percent. (No overall removal is given because TF1 was not fed from another of the pilot units. Note that in Test TF1-17, an overall removal of 82.6 percent is given because the system feed was OD(BL) which means the Oxidation Ditch during the black liquor studies had already removed the great majority of total BOD_5, but the OD followed by TF1-17 removed a total of 82.6 percent.) The last column for TF1-7 shows the settled effluent from TF1 to still contain 105 mg/l BOD_5 after treatment. Similar or self-explanatory headings for test results are used on subsequent TABLES which contain exactly the same format for test conditions.

The change in wastewater solids content across TF1 is summarized for all tests in TABLE 6 (page 29). Changes in apparent color, pH, ammonia-nitrogen, and phosphate-phosphorus are summarized in TABLE 7 (page 30). Individual test averages of all parameters for each test are included for future reference in TABLES 42 through 59 in the APPENDIX (starting with page 133).

TF1 test conditions were also arrayed with respect to organic loading rate and selected parameters from the edited test results have been plotted in FIGURES 3, 4, and 5 (pages 34, 35, and 36). (TF1 results are identified by a 1 preceding the test number). These TABLES and FIGURES are referenced in the following discussion.

BOD_5 Removal Efficiency Across TF1

For the 9 tests in which the feed for TF1 was mill clarified effluent (designated pilot feed or PF) and the recycle ratio was 1:1, the BOD_5 removal efficiency tended to drop as organic loading increased. Temperature and BOD strength of the influent appeared to influence the efficiencies as seen in FIGURE 3.

Efficiencies at the 1:1 recycle ratio ranged from 42 percent (organic loading of 250 ppd/1000 cf and hydraulic loading of 8000 gpd/sf) to almost 80 percent (70 ppd/1000 cf and 2000 gpd/sf). Three other tests resulted in efficiencies of 60 to 70 percent BOD_5 removal.

The same general downward trend with increasing organic loading is evident when the recycle to the top of the filter was zero. (See TF1 tests in FIGUPE 4.) Sludge was still being recycled to the mixing ring for agitation during these and all other tests except TF1-16. In the three tests with zero recycle to the top, the BOD_5 efficiencies ranged from approximately 36 percent (590 ppd/1000 cf and 6000 gpd/sf) up to about 51 percent (90 ppd/1000 cf and 1330 gpd/sf).

FIGURE 5 shows results when the recycle rate on TF1 was 0.5:1 in two tests and 5:1, the highest recycle run, in a third test. Removal efficiencies showed a reverse trend at the 0.5:1 rates. The values were 37 percent (190 ppd/1000 cf and 4000 gpd/sf) and 48 percent (300 ppd/1000 cf and 6000 gpd/sf). The 5:1 recycle ratio gave an average BOD_5 removal of 73 percent (90 ppd/1000 cf and 8000 gpd/sf).

All of these data have been mathematically modeled. The results will be presented at the end of this SECTION.

Solids Removal Across TF1

TABLE 6 presents the average changes in solids across TF1 during the various tests. Negative signs in this TABLE denote an increase rather than a decrease in the particular form of solids through the treatment unit.

Total solids decreased in 13 of the 17 pilot tests shown for TF1. This decrease was generally between 6 and 15 percent. Overall extremes were 58.8 percent increase to 43.2 percent decrease. Except for extremes, the volatile total solids tended to decrease approximately twice as much as the total solids. Actual concentrations can be compared in the APPENDIX TABLES.

The suspended solids portion of the total solids decreased in 14 of the 17 pilot tests. The three increases were quite substantial and were apparently associated with stabilized solids going over the clarifier weir since the associated BOD_5 level did not respond with similar increases. The reduction of suspended solids was generally between 14 and 40 percent except for the extremes. The volatile fraction of the suspended solids was seen to decrease at a slightly lesser extent than the suspended solids.

Generally it appears that reductions in total and suspended solids do occur across the TF1-clarifier system even though much biological and inert sludge is being kept in the system for varying periods of time. The upsets that do occur are infrequent but significant.

Apparent Color, pH, and Nutrient Changes Across TF1

The apparent color always decreased across TF1 as shown in TABLE 7. "Apparent color" must be distinguished from "true color" which has had the solids removed and the pH adjusted to 7.6 (see PROCEDURES). The decrease in apparent color ranged from 3 percent to as high as 52 percent but was most often between 20 and 30 percent. Treated effluent apparent color levels were generally in the 1000 to 1700 unit range. When black liquor was present, the levels doubled.

The TF1 process appeared to cause pH changes which always brought the effluent to an average level of 7.2 to 7.7 even when the average pH in the feed varied from this range by as much as 0.9 pH units. The presence of black liquor during the last two test periods meant the feed pH was generally higher. The resultant effluent from TF1 was in the range of pH 8.1 to 8.7.

TF1 was found to be a good consumer of ammonia nitrogen and phosphate phosphorus in 13 of the pilot tests. The fate of the ammonia which was frequently reduced by 50 percent or more is not accounted for in nitrification since little if any increase in nitrates was noted over the pilot feed source. Close to 30 percent of the influent phosphate was removed during treatment by TF1. Its ultimate fate may have rested with the solids which coated the trickling filter media. Other information on nutrient levels is included in SECTION VIII of this report.

Project Results on Pilot Trickling Filter 2

Pilot Trickling Filter 2 (TF2) was of conventional design as the filter recycle was trickling filter effluent before clarification. TF2 was identical to TF1 except for a collection pan instead of the special clarifier which was under TF1. A conventional design such as TF2 would normally require a separate clarifier if the trickling filter was not to be followed by any other treatment process.

Clarification was provided by using Clarifier 2 during the first 3 tests on TF2. Later tests required that TF2 effluent be settled in the laboratory before BOD analysis for clarifier simulation since Clarifier 2 had to be used in conjunction with the pilot oxidation ditch.

A total of 18 pilot tests were conducted on TF2 during the project. An additional test from TF1 can be added to these results since the special clarifier was eliminated in test TF1-16 and the two filters were run in a similar manner for comparative purposes. The results of all 19 tests will therefore be considered together.

TF2 test conditions (with test TF1-16 included) have been arrayed with respect to recycle ratio and hydraulic loading rate. The edited test results on BOD_5 efficiency of these tests are shown within the arrayed format in TABLE 8 (page 31). The effect of settling is shown but will not be plotted. The change in wastewater solids content across TF2 without clarification is shown in TABLE 9.(page 32). Other changes also without clarification are summarized in TABLE 10 (page 33). For reference, the APPENDIX contains individual test averages of all parameters for each test. (See TABLES 60 through 80, starting on page 151.)

TF2 test conditions were also arrayed with respect to organic loading rate. Selected parameters from the edited test period have been plotted in FIGURES 4, 5, and 6 (pages 35, 36, and 37). (TF2 results are identified by a 2 preceding the test number). These TABLES and FIGURES will be referenced in the following discussion.

BOD_5 Removal Efficiency Across TF2

Unsettled effluent from TF2 is quite variable in its BOD content and, for this reason, will not be discussed except to note that efficiency of removal without clarification, the effect of settling on BOD_5 removal (i.e., efficiency across a clarifier), and the resulting efficiency of removal with simulated clarification are all shown in TABLE 8 for TF2. In many cases, significant amounts of BOD were removed from TF2 effluent by settling. The result in all cases was a more consistent quality in the effluent and it is this settled value which will be discussed.

For the 7 tests in which the feed for TF2 was pilot feed (PF) and the recycle rate was 1 to 1 for feed, the settled BOD_5 removal efficiency tended to drop with increased organic loading (see FIGURE 6). There are two exceptions which can be partly explained by extra strength influent in one case and higher hydraulic loading in the other case.

BOD_5 efficiencies based on settled effluent at the 1:1 recycle rate ranged from 42 percent (organic loading of 620 ppd/1000 cf and hydraulic loading of 6000 gpd/sf) to 65 percent (125 ppd/1000 cf and 4000 gpd/sf). Black liquor was being added in the former case.

The same general downward trend with increasing organic loading is also found at zero recycle on TF2 as seen in FIGURE 4. For the tests identified with a "2", the efficiencies ranged from 36 percent (590 ppd/1000 cf and 6000 gpd/sf) to 50 percent (150 ppd/1000 cf and 2000 gpd/sf) both without black liquor. When black liquor was being added, only 13 percent of the BOD_5 was removed (1070 ppd/1000 cf and 6000 gpd/sf).

Recycle rates of 0.5:1 and 2:1 were also run on TF2. BOD_5 efficiencies of between 60 and 64 percent were obtained at the 2:1 rate while less than 45 percent was removed at the 0.5:1 rate as shown in FIGURE 5.

The dependency of the efficiency on the loading parameters will be examined later in this SECTION when the mathematical models are presented.

Solids Removal Across TF2

All determinations of solids content in TF2 effluent were made without benefit of clarification on the mixed effluent. The changes in solids across TF2 will be on this basis. TABLE 9 presents the average changes for total solids, volatile total solids, suspended solids, and volatile suspended solids. Negative values in this TABLE indicate an increase rather than a decrease of the particular form of solids.

Total solids were found to decrease slightly (2.1 to 11.8 percent) on the average in 11 of 19 test periods. Slight increases were noted several times and increases greater than 50 percent were observed twice when suspended solids losses were also significant. The volatile total solids follow the total solids trend except the increase is at a greater level in almost all cases.

Large variabilities in the suspended solids forms would be expected since the effluent was unsettled. This variability for suspended solids ranges from a decrease of 62 percent in one test average to an increase of 168 percent apparently when the filter was sloughing. The volatile suspended solids also show much variability for the same reason. Any full scale trickling filter treatment plant should be designed with a clarifier between the trickling filter and the river.

Apparent Color, pH, and Nutrient Changes Across TF2

Apparent color generally decreased across TF2 as shown in TABLE 10. Four exceptions are noted and two of them correspond to feeds other than PF. The treated effluent apparent color level generally ranged from 1000 to 1800 color units except when black liquor was present and the level jumped to 3800 to 4600 units.

The pH level was consistently brought by the biological filter to an average range of 7.2 to 7.6 except when black liquor was present and the level jumped to an average range of 8.4 to 8.6.

Nutrient levels decreased significantly in all but five test periods. There is incomplete correlation between decreases in ammonia and decreases in phosphate. Other nutrient information will be given in SECTION VIII.

Dissolved Oxygen Levels in TF1 and TF2

Based on the individual test period averages in the APPENDIX, it can be seen that the treated effluent from TF2 always carried a dissolved oxygen level of above 2.4 mg/l and usually greater than 5 mg/l. It is significant that such a high level remained even after the requirements were satisfied for the aerobic fixed bed biological process.

This aeration capacity of the trickling filter tower was the motivation for the sludge recycle on TF1. The excess oxygen was utilized in TF1 as evidenced by the average D.O. levels in the mixing ring being generally below 1.0 mg/l and often less than 0.6 mg/l.

Temperature Changes Across TF1 and TF2

The average data show temperature drops of 4° to 14°C across TF1 when PF was feed (see APPENDIX). Across TF2, which did not have a clarifier as did TF1, the average temperature dropped 3° to 10°C. When a filter was preceded by the other filter or by the OD, the decrease was found to range from only 1° to 4°C. The temperature decrease would certainly be a function of ambient temperature and recycle rate.

Mathematical Models of Trickling Filter Results

Mathematical models have been presented by many investigators to express the overall performance of trickling filters. These models generally take the form of a retardant type equation of the following form:

$$\frac{S_e}{S_o} = \exp[-kA_v t]$$

where

S_e is BOD concentration of filter effluent (mg/l)

S_o is BOD concentration of filter influent including dilution effect of any recycle (mg/l)

k is biological rate constant

A_v is specific surface of particular media (sf/cf)

t is expression of exposure time in filter and is a function of filter depth (D), specific surface (A_v), and hydraulic loading (Q).

The biological rate constant k is dependent upon temperature as follows:

$$k = k_{20}\ \theta^{T-20}$$

Generally t is expressed as:

$$t = A_v D/Q^n$$

The specific surface term (A_v) may be included in an overall biological rate constant, K, for the specific media and system, where:

$$K = kA_v$$

Eckenfelder (9)(10) has shown that the trickling filter model can be expected to take the following form:

$$\frac{S_e}{S_o} = \exp\ [-K\theta^{T-20}D/Q^n]$$

As the slime on the filter media represents a uniplanar surface through which the oxygen must diffuse, it was assumed for the basis of the modeling that θ would be 1.035 since this value has been reported previously for trickling filter media. Thus, the overall biological rate constant K and the hydraulic exponent n must be determined from the experimental results.

The hydraulic exponent n was determined from data obtained during flow tracer studies which are presented and discussed in SECTION VIII of this report. The results of these studies are shown in FIGURE 7 (page 38), with n determined to be 1.2 from the data. There are several points for TF1 which fall off the curve in FIGURE 7. TF1 discharged directly to the Clarifier 1 and it was difficult to obtain representative samples in the

dye tests at the 24 foot depth. These points were disregarded in the n determination. However, overall configuration of the filters and the filter media was identical, so the n value should be identical for the two units. The n value as determined by this analysis is used in subsequent modeling of both trickling filters.

TF1 relations for the anticipated mathematical model were computed and plotted in FIGURE 8 (page 39), from which the slope of the line would be representative of the biological reaction rate K. Each of the four points shown in this FIGURE represent an average of the respective functions of all the test data which were obtained for that given recirculation rate. These four points therefore represent the edited data which were accrued over a two-year period of operation of the respective filter.

As can be seen, the reaction rate K for TF1 is 0.063. The effluent concentration to be expected, based upon the development of this model, is presented in mathematical form in FIGURE 8. The base equation is:

$$S_e = S_o \exp[-0.063(1.035)^{T-20} D/Q^n]$$

and may be applied directly only when no recirculation flow is applied to the filter as S_o is the BOD concentration of the effluent actually contacting the filter media. Where recirculation is employed, as more often occurs, then:

$$S_o = \frac{S_a + NS_e}{1 + N}$$

where

S_a = BOD of filter influent (mg/l)

S_e = BOD of filter effluent (mg/l)

N = Percent recirculation divided by 100

Substituting into the base equation:

$$S_e = \frac{S_a + NS_e}{1 + N} \exp[-0.063(1.035)^{T-20} D/Q^{1.2}]$$

For the purpose of simplification let:

$$\exp[-0.063(1.035)^{T-20} D/Q^{1.2}] = F$$

then

$$S_e = \frac{S_a F + NS_e F}{1 + N}$$

The grouping of terms yields:

$$S_e\ (1 + N) - NF = S_a F$$

which may be expressed in the simplified form as:

$$S_e = \frac{S_a F}{(1+N-NF)}$$

FIGURE 9 (page 40) presents similar information for TF2 with each point representing a composite of the data accrued over the entire test period for that respective recirculation rate. As can be seen from this FIGURE, the reaction rate K for TF2 was found to be 0.057. The mathematical expression defining the effluent concentration to be expected from this filter is also shown on FIGURE 9.

The effluent BOD concentration to be expected from TF2 would be expressed as follows:

For no recirculation

$$S_e = S_o \exp[-0.057(1.035)^{T-20} D/Q^{1.2}]$$

with recirculation

$$S_e = \frac{S_a F}{(1+N-NF)}$$

Where

S_a = BOD of incoming wastewater

S_o = BOD of influent mixture to filter

S_e = BOD of filter effluent

N = Percent recirculation divided by 100

$F = \exp[-0.057(1.035)^{T-20} D/Q^{1.2}]$

A comparison of TF1 and TF2 is presented on FIGURE 10 (page 41). The recycle to TF1 was clarifier underflow while TF2 had the more conventional filter effluent for recycle. As can be seen, the reaction rate for TF2 is less than that for TF1. The magnitude of this difference is not great, but the indication is consistent and represents a valid indication of the relationship between the two basic systems. Thus, with all other conditions constant, the recirculation of sludge would result in a slightly higher degree of removal or a lower effluent concentration than with the recirculation of unsettled effluent as is conventionally done.

TABLE 11 (page 42) compares the observed effluent BOD concentrations and removal efficiencies for TF1 to those levels which would be predicted by the mathematical model presented above. Similar information is presented for TF2 in TABLE 12 (page 43). In general the predicted efficiencies and effluent BOD concentrations are well within 20 percent of those values actually obtained. In a few cases there is no apparent agreement between the observed values and those predicted. In these cases the feed was either modified by black liquor additions or had been biologically treated ahead of the trickling filters.

The biological reaction rate can be influenced by the character of the wastewater. Therefore, the model should be negated when the feed is not PF for which the model was developed. On this basis, the models do fit the data within an acceptable tolerance.

TABLE 5

SUMMARY OF BOD_5 RESULTS ON TRICKLING FILTER WITH SLUDGE RECYCLE
(Mead-FWQA Project on Biological Treatment)

	TEST CONDITIONS					EDITED TEST RESULTS			
							% BOD_5 Reduction		
Test	Recycle to Feed Ratio	Hydraulic Loading (gpd/sf)	Height (feet)	System Feed	Organic Loading (ppd/1000 cf)	Temp. (°C)	Unit Settled	Overall	Settled Effluent BOD_5 (mg/l)
TRICKLING FILTER TESTS WITH SLUDGE RECYCLE									
TF1-7	0:1	1330	22	PF(2)	90	21	51.6	-	105
TF1-6	0:1	2660	22	PF(1)	180	22	48.1	-	112
TF1-17	0:1	3000	24	OD(BL)	90	12	5.7	82.6	98
TF1-10	0.5:1	4000	24	PF(2)	190	27	37.4	-	133
TF1-9	0.5:1	6000	24	PF(2)	300	26	47.9	-	108
TF1-4	1:1	2000	24	PF(1)	70	25	79.5	-	43
TF1-1	1:1	4000	24	PF(1)	140	31	67.5	-	73
TF1-5	1:1	4000	24	PF(1)	125	31	60.0	-	80
TF1-11	1:1	4000	24	PF(2)	140	26	68.6	-	62
TF1-14	1:1	4000	24	PF(3)	140	32	50.6	-	99
TF1-13	1:1	4000	24	TF2(3)	110	32	48.7	63.8	87
TF1-2	1:1	6000	24	PF(1)	230	33	46.3	-	111
TF1-8	1:1	6000	24	PF(2)	280	22	48.1	-	153
TF1-12	1:1	6000	24	PF(2)	200	33	47.8	-	101
TF1-18	1:1	6000	24	TF2(BL)	420	30	34.6	56.9	273
TF1-3	1:1	8000	24	PF(1)	250	35	42.1	-	110
TF1-15	5:1	8000	24	PF(3)	90	29	72.8	-	46

SUMMARY OF SOLIDS RESULTS ON TRICKLING FILTER WITH SLUDGE RECYCLE
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS: Recycle to Feed Ratio	Hydraulic Loading (gpd/sf)	Height (feet)	System Feed	Organic Loading (ppd/1000 cf)	EDITED TEST RESULTS: % Solids Reduction: Total	Volatile Total	Suspended	Volatile Suspended
TRICKLING FILTER TESTS WITH SLUDGE RECYCLE									
TF1-7	0:1	1330	22	PF(2)	90	-58.8	-99.7	25.9	14.8
TF1-6	0:1	2660	22	PF(1)	180	26.6	29.6	39.4	28.7
TF1-17	0:1	3000	24	OD(BL)	90	3.3	3.3	38.4	22.4
TF1-10	0.5:1	4000	24	PF(2)	190	0.3	7.8	-105.4	-84.2
TF1-9	0.5:1	6000	24	PF(2)	300	-10.3	21.7	34.9	34.1
TF1-4	1:1	2000	24	PF(1)	70	24.8	38.8	73.5	57.8
TF1-1	1:1	4000	24	PF(1)	140	- 1.5	-10.8	-21.3	32.2
TF1-5	1:1	4000	24	PF(1)	125	14.2	22.7	24.5	19.5
TF1-11	1:1	4000	24	PF(2)	140	15.8	27.6	33.4	24.4
TF1-14	1:1	4000	24	PF(3)	140	6.4	17.8	-128.3	-99.8
TF1-13	1:1	4000	24	TF2(3)	110	43.2	27.5	50.3	60.1
TF1-2	1:1	6000	24	PF(1)	230	13.5	18.2	14.9	2.4
TF1-8	1:1	6000	24	PF(2)	280	18.3	33.3	36.9	29.1
TF1-12	1:1	6000	24	PF(2)	200	8.9	19.5	28.4	5.0
TF1-18	1:1	6000	24	TF2(BL)	420	6.8	12.3	14.2	11.7
TF1-3	1:1	8000	24	PF(1)	250	8.5	12.7	27.6	-10.7
TF1-15	5:1	8000	24	PF(3)	90	6.7	15.5	23.6	- 2.5

TABLE 6

TABLE 7

SUMMARY OF COLOR, pH, AND NUTRIENT RESULTS ON TRICKLING FILTER WITH SLUDGE RECYCLE
(Mead-FWQA Project on Biological Treatment)

	TEST CONDITIONS					EDITED TEST RESULTS			
						% Reduction			
Test	Recycle to Feed Ratio	Hydraulic Loading (gpd/sf)	Height (feet)	System Feed	Organic Loading (ppd/1000 cf)	Apparent Color	pH	NH_3-N	PO_4-P
TRICKLING FILTER TESTS WITH SLUDGE RECYCLE									
TF1-7	0:1	1330	22	PF(2)	90	17.8	7.1	27.5	30.6
TF1-6	0:1	2660	22	PF(1)	180	25.6	11.2	50.5	30.3
TF1-17	0:1	3000	24	OD(BL)	90	13.3	- 4.4	-270.7	-22.2
TF1-10	0.5:1	4000	24	PF(2)	190	7.1	5.7	56.2	29.9
TF1-9	0.5:1	6000	24	PF(2)	300	12.5	5.3	49.8	50.9
TF1-4	1:1	2000	24	PF(1)	70	51.6	7.0	46.7	33.2
TF1-1	1:1	4000	24	PF(1)	140	25.5	2.6	64.7	28.5
TF1-5	1:1	4000	24	PF(1)	125	38.5	4.0	0.1	-25.2
TF1-11	1:1	4000	24	PF(2)	140	37.0	- 1.0	35.1	36.9
TF1-14	1:1	4000	24	PF(3)	140	23.0	3.5	77.0	2.0
TF1-13	1:1	4000	24	TF2(3)	110	22.3	1.0	-12.5	-36.6
TF1-2	1:1	6000	24	PF(1)	230	27.5	7.4	50.0	19.2
TF1-8	1:1	6000	24	PF(2)	280	22.0	2.8	-	-
TF1-12	1:1	6000	24	PF(2)	200	6.9	- 3.3	57.9	0.7
TF1-18	1:1	6000	24	TF2(BL)	420	3.0	3.9	66.6	28.2
TF1-3	1:1	8000	24	PF(1)	250	22.2	11.1	0.0	46.7
TF1-15	5:1	8000	24	PF(3)	90	3.0	6.5	73.6	25.1

SUMMARY OF BOD_5 RESULTS ON TRICKLING FILTER WITH FILTRATE RECYCLE
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS: Recycle to Feed Ratio	Hydraulic Loading (gpd/sf)	Height (feet)	System Feed	Organic Loading (ppd/1000 cf)	EDITED TEST RESULTS: Temp. (°C)	% BOD_5 Efficiency: Unit Mixed	Effect of Settling	Unit Settled	Overall	Settled Effluent BOD_5 (mg/l)
TRICKLING FILTER TESTS WITH FILTRATE RECYCLE											
TF2-2	0:1	2000	24	PF(1)	150	32	25.0	32.8	49.6	-	97
TF2-3	0:1	4000	24	PF(1)	250	33	26.0	15.0	37.2	-	122
TF1-16	0:1	6000	24	PF(3)	590	28	30.9	8.0	36.4	-	185
TF2-16	0:1	6000	24	PF(3)	590	28	16.1	25.8	37.7	-	181
TF2-17	0:1	6000	24	PF(BL)	1070	24	7.6	5.8	13.0	-	462
TF2-15	0:1	6000	24	OD(3)	40	25	negative	34.4	11.8	90.4	16
TF2-10	0.5:1	4000	24	PF(2)	190	29	31.1	17.2	43.0	-	121
TF2-9	0.5:1	6000	24	PF(2)	300	28	17.6	22.8	36.4	-	132
TF2-4	1:1	4000	16	PF(1)	270	33	40.2	28.6	57.3	-	89
TF2-1	1:1	4000	24	PF(1)	140	35	53.3	22.3	63.7	-	81
TF2-7	1:1	4000	24	PF(2)	125	25	29.1	51.2	65.4	-	79
TF2-13	1:1	4000	24	PF(3)	160	35	29.4	16.9	41.4	-	141
TF2-11	1:1	4000	24	TF1(2)	55	25	negative	73.1	6.7	70.7	58
TF2-14	1:1	4000	24	TF1(3)	70	28	negative	41.5	69.1	84.7	31
TF2-8	1:1	6000	24	PF(2)	280	26	39.5	21.1	52.3	-	140
TF2-12	1:1	6000	24	PF(2)	195	33	31.5	26.2	49.5	-	98
TF2-18	1:1	6000	24	PF(BL)	620	31	34.2	12.1	42.1	-	366
TF2-5	2:1	4000	16	PF(1)	125	33	41.1	37.3	63.1	-	74
TF2-6	2:1	4000	24	PF(1)	80	26	32.7	41.3	60.5	-	85

TABLE 8

TABLE 9

SUMMARY OF SOLIDS RESULTS ON TRICKLING FILTER WITH FILTRATE RECYCLE
(Mead-FWQA Project on Biological Treatment)

	TEST CONDITIONS					EDITED TEST RESULTS			
						% Solids Reduction			
Test	Recycle to Feed Ratio	Hydraulic Loading (gpd/sf)	Height (feet)	System Feed	Organic Loading (ppd/1000 cf)	Total	Volatile Total	Suspended	Volatile Suspended
TRICKLING FILTER TESTS WITH FILTRATE RECYCLE									
TF2-2	0:1	2000	24	PF(1)	150	3.4	14.3	-12.1	-27.1
TF2-3	0:1	4000	24	PF(1)	250	4.3	11.3	6.8	-37.6
TF1-16	0:1	6000	24	PF(3)	590	5.3	6.4	7.2	6.2
TF2-16	0:1	6000	24	PF(3)	590	- 8.0	-14.7	-167.8	-68.5
TF2-17	0:1	6000	24	PF(BL)	1070	- 1.1	- 0.9	5.2	1.8
TF2-15	0:1	6000	24	OD(3)	40	- 5.7	0.1	-32.5	16.0
TF2-10	0.5:1	4000	24	PF(2)	190	4.8	10.2	17.5	14.0
TF2-9	0.5:1	6000	24	PF(2)	300	11.8	13.3	23.1	25.2
TF2-4	1:1	4000	16	PF(1)	270	9.8	17.5	21.3	0.1
TF2-1	1:1	4000	24	PF(1)	140	- 8.6	- 4.5	-24.2	-34.3
TF2-7	1:1	4000	24	PF(2)	125	-53.1	-44.2	-97.1	-109.3
TF2-13	1:1	4000	24	PF(3)	160	-51.8	- 2.8	-10.5	-28.0
TF2-11	1:1	4000	24	TF1(2)	55	- 7.8	- 9.6	-27.1	-27.4
TF2-14	1:1	4000	24	TF1(3)	70	- 0.5	6.3	62.4	59.4
TF2-8	1:1	6000	24	PF(2)	280	8.1	6.7	10.8	- 3.5
TF2-12	1:1	6000	24	PF(2)	195	5.8	13.8	13.4	- 4.3
TF2-18	1:1	6000	24	PF(BL)	620	2.7	9.3	-17.4	-23.3
TF2-5	2:1	4000	16	PF(1)	125	2.8	8.6	5.4	- 3.2
TF2-6	2:1	4000	24	PF(1)	80	2.1	11.4	- 4.6	-20.9

SUMMARY OF COLOR, pH AND NUTRIENT RESULTS ON TRICKLING FILTER WITH FILTRATE RECYCLE
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS: Recycle to Feed Ratio	Hydraulic Loading (gpd/sf)	Height (feet)	System Feed	Organic Loading (ppd/1000 cf)	EDITED TEST RESULTS: % Reduction Apparent Color	pH	NH_3-N	PO_4-P
TRICKLING FILTER TESTS WITH FILTRATE RECYCLE									
TF2-2	0:1	2000	24	PF(1)	150	25.3	6.0	66.1	50.0
TF2-3	0:1	4000	24	PF(1)	250	21.5	11.8	58.3	48.8
TF1-16	0:1	6000	24	PF(3)	590	4.1	- 0.7	45.4	45.9
TF2-16	0:1	6000	24	PF(3)	590	- 2.0	- 2.2	- 3.1	-35.4
TF2-17	0:1	6000	24	PF(BL)	1070	2.7	1.5	- 4.3	8.8
TF2-15	0:1	6000	24	OD(3)	40	-21.8	- 1.5	-25.0	-33.3
TF2-10	0.5:1	4000	24	PF(2)	190	12.1	4.7	34.8	21.6
TF2-9	0.5:1	6000	24	PF(2)	300	9.7	6.0	40.0	29.7
TF2-4	1:1	4000	16	PF(1)	270	29.0	8.8	50.4	20.9
TF2-1	1:1	4000	24	PF(1)	140	31.0	5.2	62.4	31.3
TF2-7	1:1	4000	24	PF(2)	125	- 4.0	1.8	22.3	3.2
TF2-13	1:1	4000	24	PF(3)	160	7.9	- 2.7	12.0	37.9
TF2-11	1:1	4000	24	TF1(2)	55	- 3.2	- 1.4	46.7	-15.6
TF2-14	1:1	4000	24	TF1(3)	70	13.7	- 0.4	-100.0	- 4.2
TF2-8	1:1	6000	24	PF(2)	280	13.7	0.6	61.9	14.0
TF2-12	1:1	6000	24	PF(2)	195	15.7	- 6.7	23.7	17.5
TF2-18	1:1	6000	24	PF(BL)	620	18.2	7.6	-34.4	11.7
TF2-5	2:1	4000	16	PF(1)	125	26.5	5.6	29.4	-36.7
TF2-6	2:1	4000	24	PF(1)	80	20.3	10.4	44.6	14.3

TABLE 10

TRICKLING FILTER 1 WITH I:I RECYCLE
(Mead-FWQA Project on Biological Treatment)

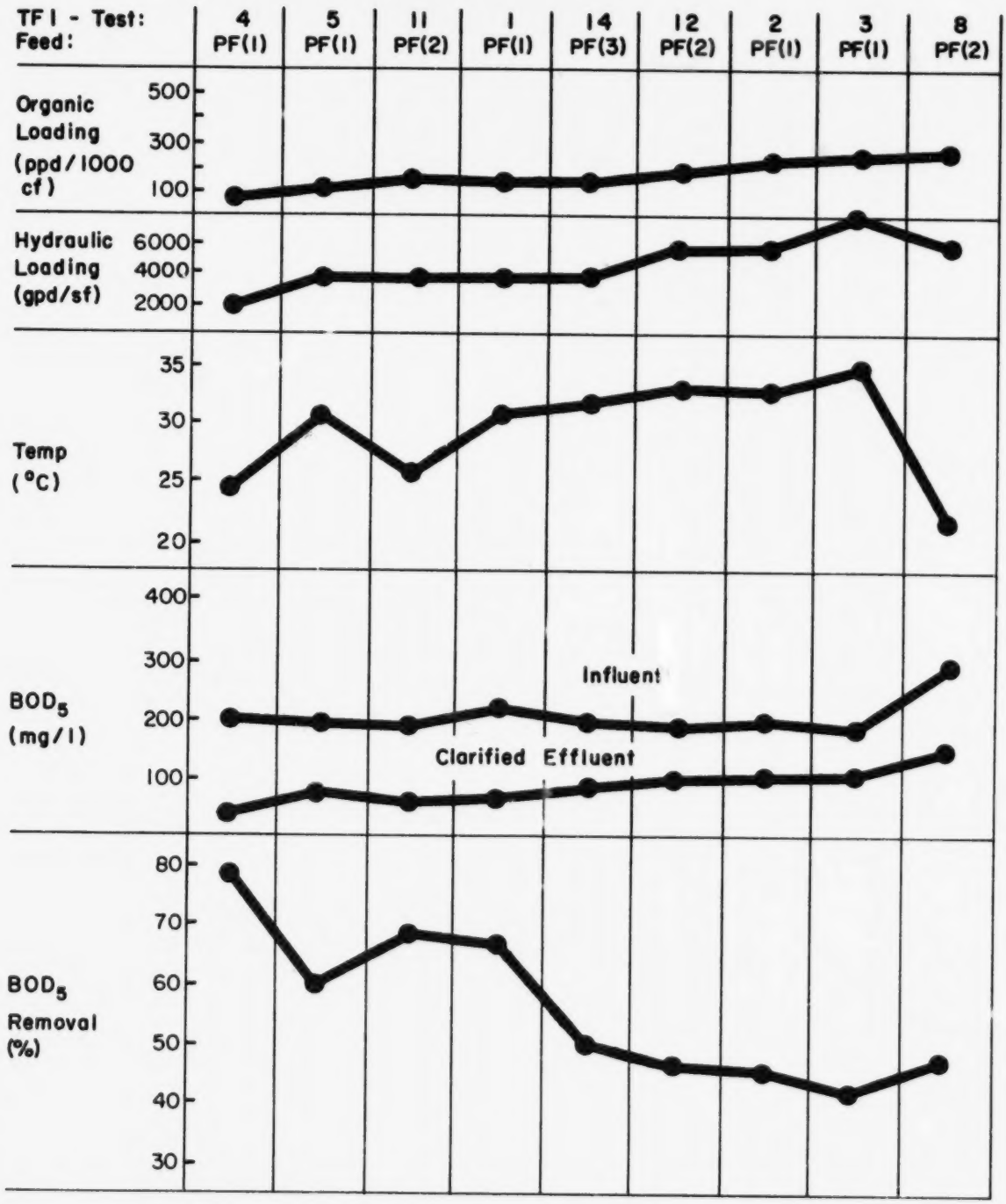


FIGURE 3

PILOT TRICKLING FILTERS WITH "O" RECYCLE

(Mead-FWQA Project on Biological Treatment)

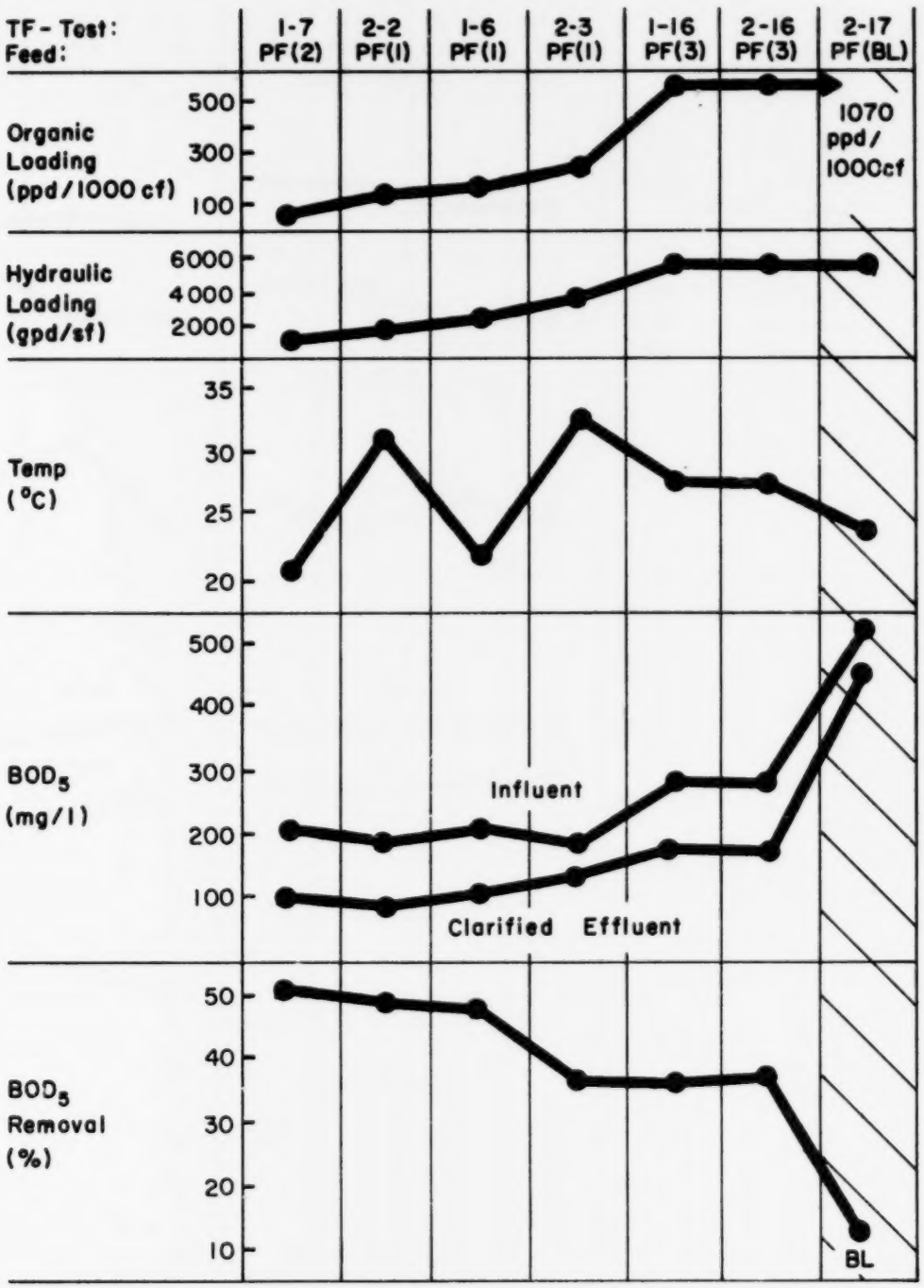


FIGURE 4

TRICKLING FILTERS AT OTHER RECYCLE RATES

(Mead-FWQA Project on Biological Treatment)

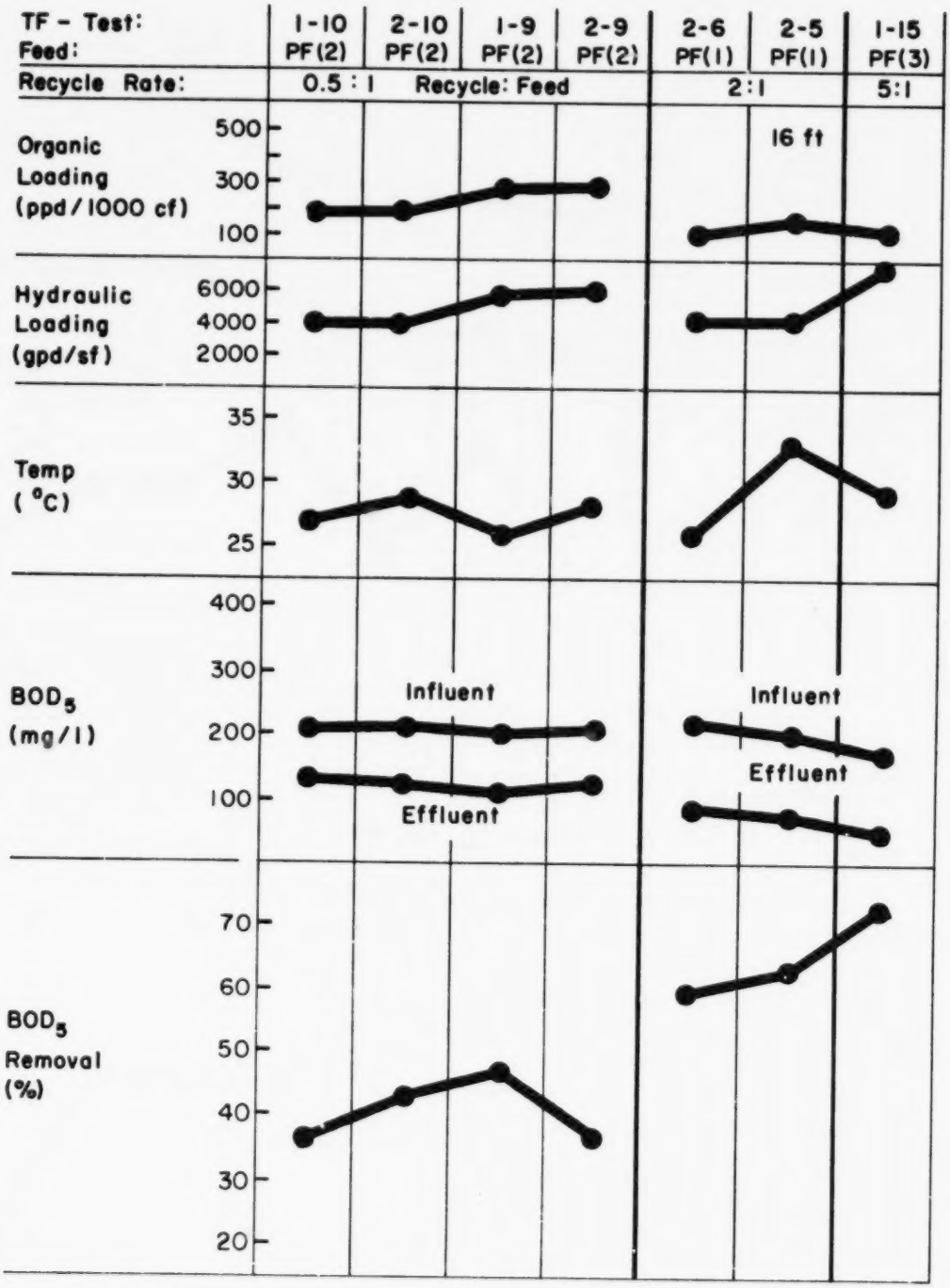


FIGURE 5

TRICKLING FILTER 2 WITH I:I RECYCLE
(Mead-FWQA Project on Biological Treatment)

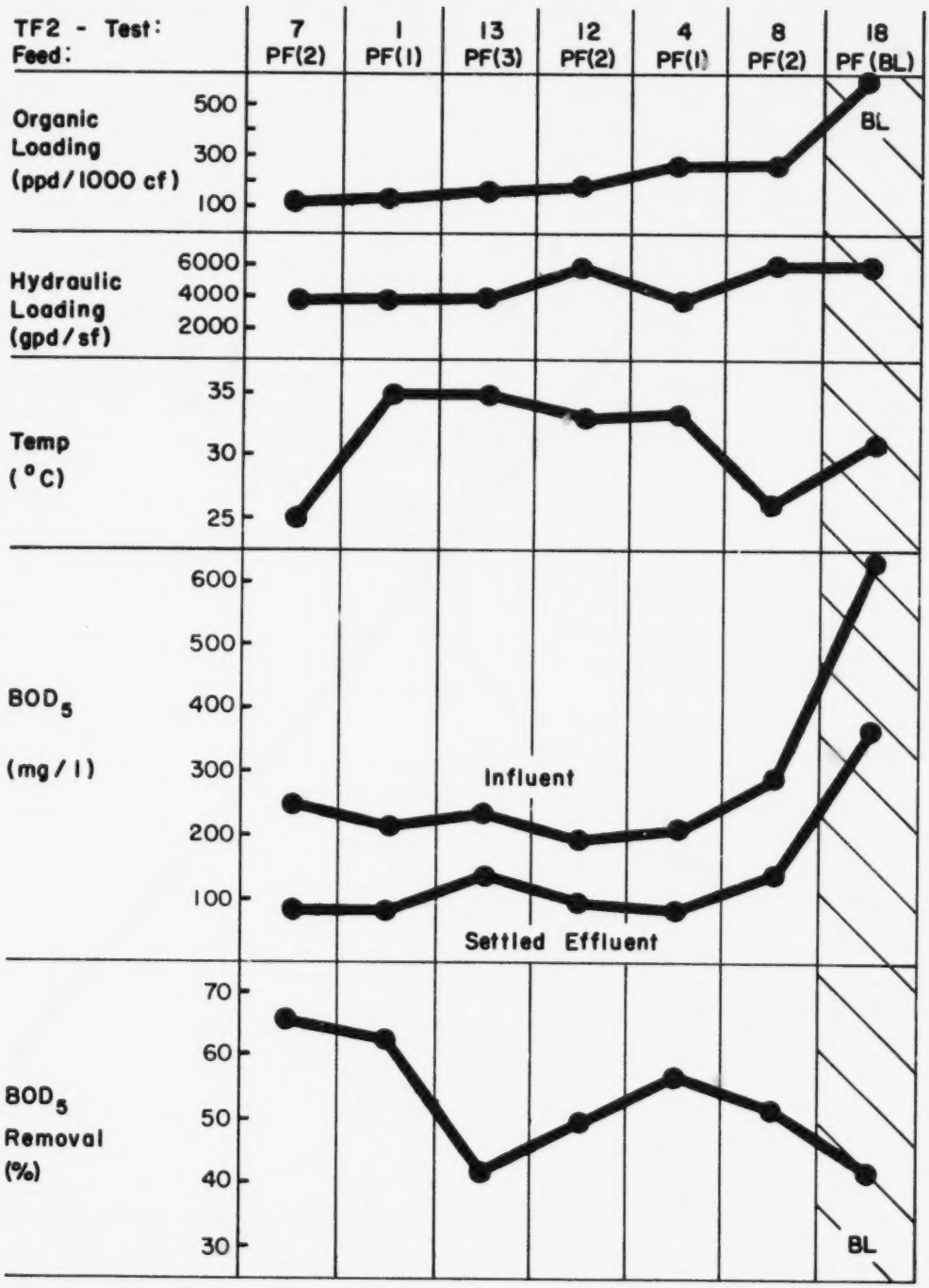


FIGURE 6

DETERMINATION OF "n" FROM DYE STUDIES ON FILTERS

(Mead-FWQA Project on Biological Treatment)

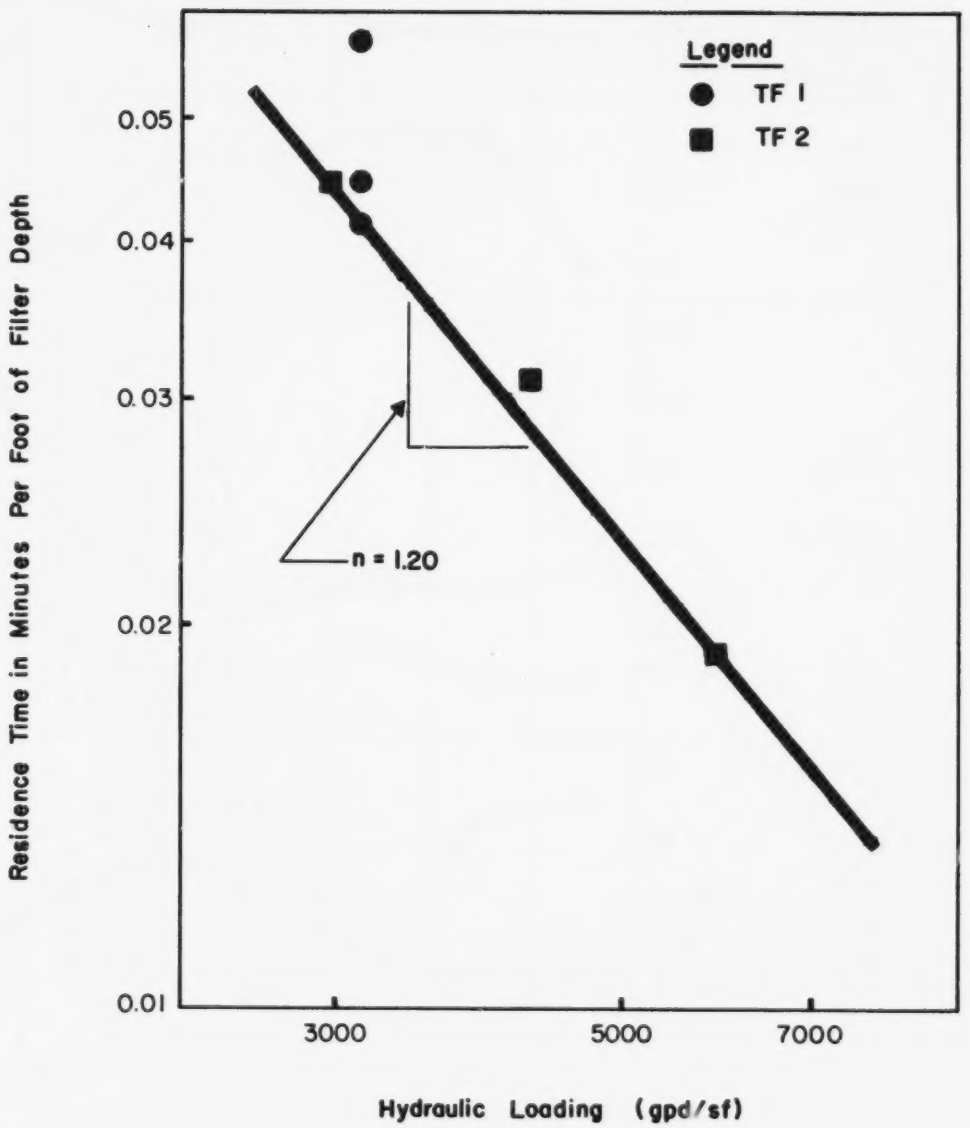


FIGURE 7

MODEL FOR TRICKLING FILTER 1
(Mead-FWQA Project on Biological Treatment)

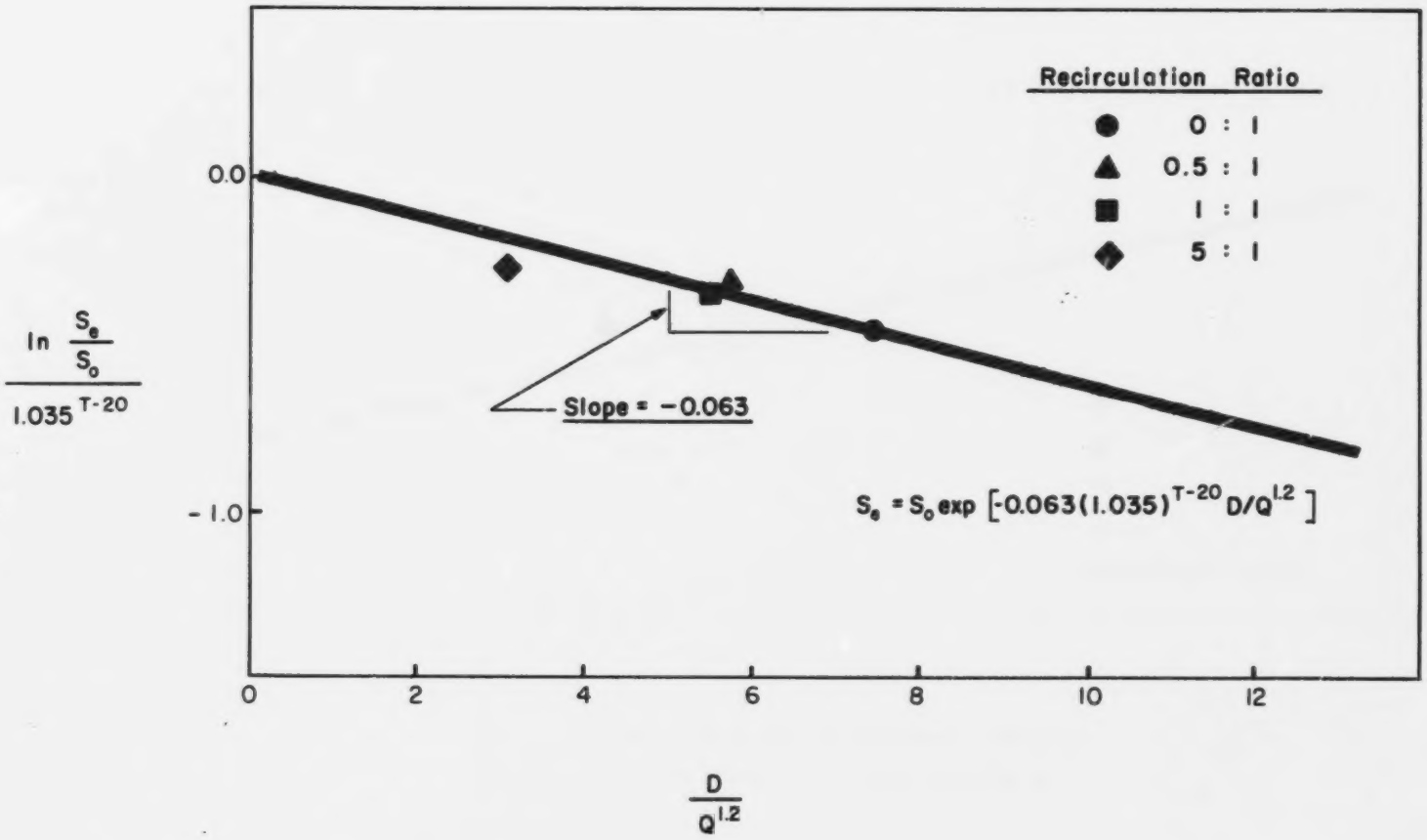
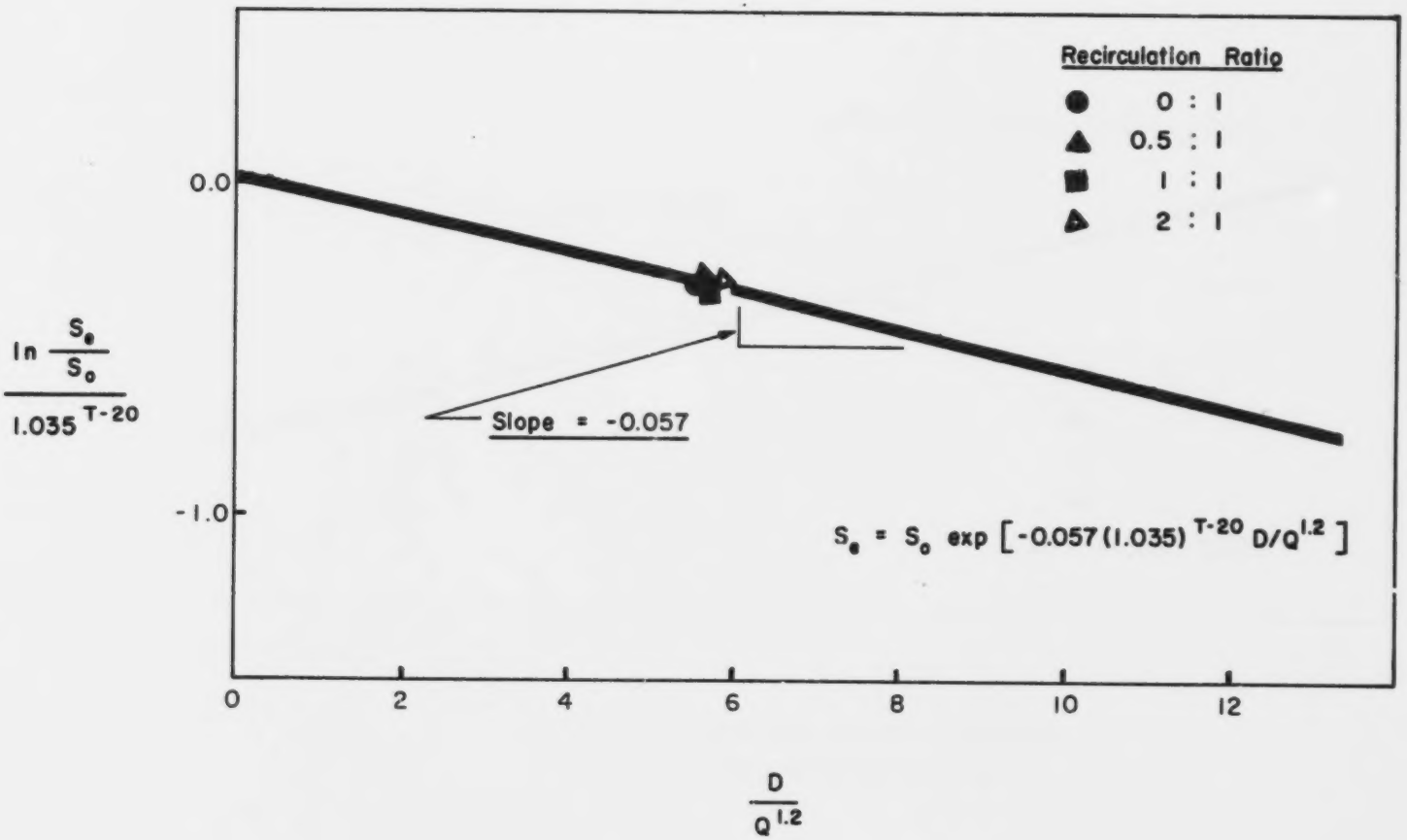


FIGURE 8

FIGURE 9

MODEL FOR TRICKLING FILTER 2
(Mead-FWQA Project on Biological Treatment)



TRICKLING FILTER RESPONSE TO SLUDGE RECIRCULATION
(Mead-FWQA Project on Biological Treatment)

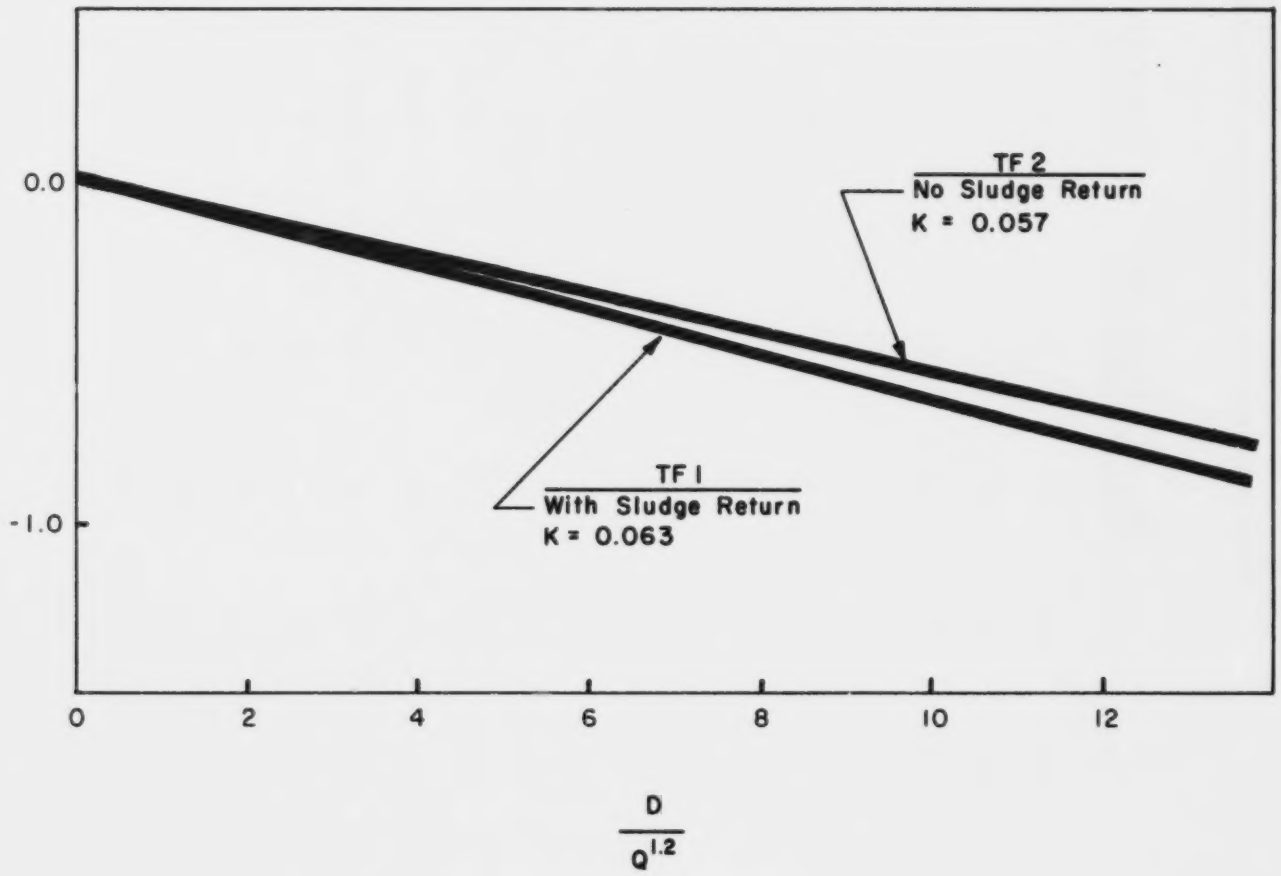


FIGURE 10

COMPARISON OF OBSERVED EFFICIENCIES AND TF1 MODEL
(Mead-FWQA Project on Biological Treatment)

Test	Feed	BOD_5 of Effluent(mg/1) Observed	BOD_5 of Effluent(mg/1) Predicted	Treatment Efficiency(%) Observed	Treatment Efficiency(%) Predicted
TF1-1	PF	73	79	67.5	64.5
TF1-2	PF	111	100	46.3	51.5
TF1-3	PF	110	108	42.1	43.4
TF1-4	PF	43	26	79.5	87.7
TF1-5	PF	80	71	60.0	64.5
TF1-6	PF	112	106	48.1	50.8
TF1-7	PF	105	48	51.6	77.5
TF1-8	PF	153	175	48.1	40.4
TF1-9	PF	108	130	47.9	37.4
TF1-10	PF	133	99	37.4	53.2
TF1-11	PF	62	80	68.6	59.1
TF1-12	PF	101	94	47.8	51.5
TF1-13	TF2	87	48	38.3(48.7)*	65.6
TF1-14	PF	99	69	50.6	65.6
TF1-15	PF	46	60	72.8	64.4
TF1-16	PF	185	203	36.4	30.1
TF1-17	OD(BL)	98	65	5.7	37.9
TF1-18	TF2(BL)	273	189	25.4(34.6)*	48.4

*Efficiency based on unsettled TF2 feed.

TABLE 11

COMPARISON OF OBSERVED EFFICIENCIES AND TF2 MODEL
(Mead-FWQA Project on Biological Treatment)

Test	Feed	BOD_5 of Effluent(mg/l) Observed	Predicted	Treatment Efficiency(%) Observed	Predicted
TF2-1	PF	81	76	63.7	65.7
TF2-2	PF	97	33	49.6	82.6
TF2-3	PF	122	104	37.2	46.6
TF2-4	PF	89	103	57.3	50.9
TF2-5	PF	74	78	63.1	60.9
TF2-6	PF	85	74	60.5	65.6
TF2-7	PF	79	111	65.4	54.9
TF2-8	PF	140	173	52.3	41.4
TF2-9	PF	132	131	36.4	36.5
TF2-10	PF	121	101	43.0	52.1
TF2-11	TF1	58	27	6.7	56.0
TF2-12	PF	98	100	49.5	48.5
TF2-13	PF	141	82	41.4	65.7
TF2-14	TF1	31	41	69.1	58.1
TF2-15	OD	16	13	11.8	25.4
TF2-16	PF	181	210	37.7	27.7
TF2-17	PF(BL)	462	396	13.0	25.4
TF2-18	PF(BL)	366	339	42.1	46.4

TABLE 12

SECTION VII

AERATED LAGOON TREATMENT

The Aerated Lagoon Process

The aerated lagoon is a basin in which oxygenation is provided by mechanical or diffused aeration units or mechanical surface aeration. The turbulence level maintained in the basin is a function of the power input to the aerator and should be sufficient to insure distribution of oxygen throughout the lagoon contents. Such power requirements are generally much less than those necessary to maintain all the suspended solids in suspension. Without sludge recycle, biological activity proceeds at a much lower rate than in true activated sludge, thereby requiring detention times measured in days rather than hours.

The process requires minimum control and has been often used where the necessary land is available. Seventeen kraft mills in the U.S. are operating aerated lagoons. More complete descriptions of the process can be found in the literature (9)(12).

Project Results on Pilot Aerated Lagoon

A total of 13 test periods were completed on the pilot Aerated Lagoon (AL) during the project. An additional two test periods on the pilot Oxidation Ditch (OD) were conducted without sludge return. These two tests also represent the aerated lagoon process (with a different type of aerator) and so will be included in the analysis in this SECTION.

Laboratory settling of AL effluent was found to have a great effect on BOD_5 levels and so this sample modification was added with test AL-5. The BOD_5 data prior to this test period were produced on an effluent sample from AL without benefit of settling. Such a sample is termed "mixed" in this report to distinguish from "settled" which infers the effluent from clarification in the field or the supernatant from settling in the laboratory in an Imhoff Cone. Beginning with test AL-5, all AL samples were analyzed both mixed and settled for BOD_5. All determinations other than BOD_5 were on "mixed" effluent only.

TABLES 81 through 93 in the APPENDIX (starting with page 172) contain averages of all test parameters on AL for each of the 13 test periods. Both feed and effluent characteristics are shown. TABLES 13 through 15 (pages 50 through 52) show the test conditions on AL arrayed with respect to detention time and contain the average change through treatment of selected parameters. The format is similar to that explained in SECTION IV.

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FIGURES 11 (page 53) and 12 (page 54) show the BOD_5 results when the test periods are arrayed with respect to average temperature in the lagoon. These TABLES and FIGURES will be referenced in the following discussion.

BOD_5 Removals Across Pilot Aerated Lagoon

Without clarification as shown in FIGURE 11, the BOD removal increased with increasing temperatures from a low of 34.7 percent (16°C and 2.3 days detention) to a high of 69.7 percent (30° and 2.3 days). The pilot Oxidation Ditch without clarification and sludge return was run concurrently with two of the AL tests. The detention times were longer in the OD and the temperatures were 1°C higher but efficiencies were lower (i.e., 57.3 percent vs. 60.3 percent and 67.0 percent vs. 69.7 percent in AL). These differences in efficiency are slight and are not considered to be significant.

When AL effluent was settled, as shown in FIGURE 12, the trend of increased BOD removal with increasing temperatures was no longer evident. Without settling, the removals were quite erratic. The efficiencies based on settled effluent when PF without black liquor was the feed show a consistency between 80.6 and 82.3 percent removal (except for test AL-7) at temperatures ranging from an average of 14°C to 23°C and detention times from 1.7 to 3.8 days. This unit and these results constituted very consistent operation. A mathematical model of these results is presented later in this SECTION.

It should be noted that a clarifier on the end of the pilot Aerated Lagoon would have removed an additional 10.6 percent to 74.0 percent of the BOD_5 in the treated effluent. This effect of settling (see FIGURE 12) appeared to be an inverse function of detention time, although exceptions can be noted. The very significant reduction at short detention times due to external settling should be considered in future designs.

Solids Removals Across Pilot Aerated Lagoon

Solids would not be expected to be removed consistently with short detention time aerated lagoon treatment unless clarification is provided. The fate of influent organic dissolved solids would be conversion to biomass. This biomass plus suspended solids in the lagoon influent can either settle out in the lagoon or be kept suspended (function of power input) and thus overflow with the effluent. Settled solids in the bottom can decompose and might add to the dissolved solids of the basin contents. TABLE 14 shows that most forms of solids increased on the average across AL during many of the edited test periods. These increases were interspersed with significant removals in several tests. The overall pattern is not clearly defined, especially when considering only data from the edited test period which was chosen to represent equilibrium of BOD_5 efficiency. Clarification of effluent from a short detention time aerated lagoon would be expected to result in reduced solids and to produce a more consistent effluent quality than can be reported here.

Apparent Color, pH, and Nutrient Changes Across Pilot Aerated Lagoon

Average changes in apparent color, pH, and both added nutrient forms across AL have been tabulated for the edited test periods and are shown in TABLE 15.

Reductions in apparent color did result in all but 3 tests and were above 10 percent in 9 cases. Note the distinction between "apparent color" as is reported here and "true color" which is the solution color after the solids have been removed and pH adjusted to 7.6 (see PROCEDURES).

Resulting apparent color values in the treated effluent when PF without black liquor was the feed source were found to range from 1000 to 1750 with a single exception. The addition of black liquor raised the value to 3400.

The pH changes through AL when PF without black liquor was feed always resulted in final levels of 7.3 to 7.7 on the average for each test period. The effluent pH value was higher both when AL followed OD and in the final test with its long detention time which caused a drop in pH of 1.2 units to a treated effluent pH value of 7.8.

Ammonia nitrogen levels decreased significantly through AL in all but one test (a combination test with TF1) and in the final test when black liquor was being added as seen in TABLE 15. Phosphate phosphorus changes were not so well defined, probably because of the variable solids content in the AL effluent.

Dissolved Oxygen Levels in Pilot Aerated Lagoon

Review of the average results for each test period on AL as contained in the individual summaries in the APPENDIX will show that the dissolved oxygen level being maintained in AL was significantly greater than 0.5 mg/l in all but the last test period when black liquor was present. Therefore, it is reasoned that dissolved oxygen was not limiting to the biological process except in the last test. In that test the BOD_5 removal efficiency was the highest of any test and so the limitation, if actual, is not apparent.

Change in Temperature Across Pilot Aerated Lagoon

On the average, as shown in the test period results for AL in the APPENDIX, the temperature decreased during treatment by 7 to 17 °C when PF was feed. The decrease was only 4°C when AL followed OD in series. The lowest resulting temperature in the lagoon basin was 11°C. The temperature change is a function of ambient temperature, basin volume, exposed surface area and detention time.

Mathematical Model of Aerated Lagoon Results

The mathematical model for a completely mixed aerobic system shows dependency upon the influent and effluent concentrations, the biological solids under aeration, temperature, detention time, and a reaction rate constant which would be a function of both the makeup and character of the wastewater being treated, as well as the biological system in which the wastewater is subjected for treatment. Analysis of the aerated lagoon data with respect to these various parameters indicated a best fit by the mathematical form represented in FIGURE 13 (page 55). The respective points which are shown represent the function of the average of the data obtained during each particular test period. The range marks radiating from the respective points indicate the data from the individual weeks in each test average.

The mixed liquor volatile suspended solids were found to have little influence upon the mathematical model for the system. A major reason could be the extremely low solids content of the system, which would undoubtedly be reflected to some extent in the biological rate constant k which was established for this system. A reaction rate constant of 1.424 and a temperature coefficient of 1.023 was established for the aerated lagoon system. The average F/M ratio of the 5 points represented by the plot is 0.4. The line of best fit shown in FIGURE 13 was established by the method of least squares.

The relationship is:

$$\frac{S_o - S_e}{S_e} = 1.424(1.023)^{T-20}t$$

Where

S_o = BOD of influent (mg/l)

S_e = BOD of effluent (mg/l)

t = Detention time (days)

T = Temperature (°C)

This relationship may be modified as follows to express the effluent BOD to be expected from the unit directly.

Since the above equation can be expressed

$$\frac{S_o}{S_e} - 1 = 1.424(1.023)^{T-20}t$$

then

$$\frac{S_o}{S_e} = 1+1.424(1.023)^{T-20_t}$$

or

$$\frac{S_e}{S_o} = \frac{1}{1+1.424(1.023)^{T-20_t}}$$

hence

$$S_e = \frac{S_o}{1+1.424(1.023)^{T-20_t}}$$

A comparison of the observed effluent BOD concentrations and efficiencies with those which would be predicted by this model are presented in TABLE 16 (page 56). These comparisons indicate relatively close agreement between those values observed and those values predicted except in the cases where the feed had received biological treatment prior to the aerated lagoon or where the feed had been supplemented with black liquor. In both cases the quality of the wastewater had been modified. Therefore, the biological rate constant would be affected. It is interesting to note, however, that in a case where the feed had been supplemented with black liquor and subjected to trickling filtration prior to the aerated lagoon (test AL-12), the lagoon performed as would be predicted for the unsupplemented primary feed when fed directly to the aerated lagoon.

TABLE 13

SUMMARY OF AERATED LAGOON BOD_5 RESULTS
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS: Deten. Time (days)	Depth (feet)	System Feed	Organic Loading (ppd/1000cf)	(F/M Ratio)	EDITED TEST RESULTS: Temp. (°C)	% BOD_5 Reduction: Unit Mixed	Effect of Settling	Unit Settled	Over-all	Settled Effluent BOD_5 (mg/l)
AL-8	1.4	7.7	OD(2-3)	1.1	0.15	26	negative	61.0	negative	86.0	32
AL-2	1.5	6.7	PF(1)	7.3	0.37	30	60.3	-	-	-	-
AL-9	1.7	5.5	OD(3)	0.4	0.06	25	negative	42.0	negative	93.4	13
AL-11	1.7	5.5	TF1(3)	6.2	0.65	15	57.3	54.9	80.7	85.8	40
AL-12	1.8	5.0	TF2(BL)	12.1	0.59	11	64.2	11.0	68.2	74.1	146
AL-1	2.3	6.7	PF(1)	5.0	0.64	30	69.7	-	-	-	-
AL-4	2.3	6.7	PF(1-2)	5.3	0.36	16	34.7	-	-	-	-
AL-7	2.3	6.7	PF(2)	5.0	0.30	24	44.9	56.6	76.1	-	49
AL-3	3.0	6.7	PF(1)	3.6	0.23	23	43.9	-	-	-	-
AL-6	3.0	6.7	PF(2)	3.8	0.27	21	62.9	51.3	81.9	-	38
AL-10	3.5	7.7	PF(3)	2.3	0.07	23	35.9	75.1	84.0	-	35
AL-5	3.8	6.7	PF(2)	3.6	0.53	14	77.3	22.0	82.3	-	39
AL-13	7.0	7.7	PF(BL)	3.4	0.13	23	81.4	10.6	83.3	-	104

SUMMARY OF AERATED LAGOON SOLIDS RESULTS
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS					EDITED TEST RESULTS			
	Deten. Time (days)	Depth (feet)	System Feed	Organic Loading (ppd/1000cf)	(F/M Ratio)	% Solids Reduction			
						Total	Volatile Total	Suspended	Volatile Suspended
AL-8	1.4	7.7	OD(2-3)	1.1	0.15	- 2.4	- 8.5	-436.9	-378.1
AL-2	1.5	6.7	PF(1)	7.3	0.37	-12.9	-17.6	-51.5	-107.9
AL-9	1.7	5.5	OD(3)	0.4	0.06	-14.3	-20.9	-59.1	- 68.0
AL-11	1.7	5.5	TF1(3)	6.2	0.65	6.8	12.5	24.0	12.2
AL-12	1.8	5.0	TF2(BL)	12.1	0.59	14.4	24.7	26.8	11.1
AL-1	2.3	6.7	PF(1)	5.0	0.64	2.0	14.2	- 3.7	- 12.9
AL-4	2.3	6.7	PF(1-2)	5.3	0.36	-51.2	-43.2	-95.0	-114.8
AL-7	2.3	6.7	PF(2)	5.0	0.30	- 2.2	6.6	-65.3	- 76.4
AL-3	3.0	6.7	PF(1)	3.6	0.23	- 3.9	- 1.2	-16.5	- 42.1
AL-6	3.0	6.7	PF(2)	3.8	0.27	- 2.4	9.2	-13.4	- 33.0
AL-10	3.5	7.7	PF(3)	2.3	0.07	-30.6	-26.7	-150.4	-211.7
AL-5	3.8	6.7	PF(2)	3.6	0.53	26.0	30.3	60.8	41.1
AL-13	7.0	7.7	PF(BL)	3.4	0.13	9.9	21.8	-25.3	- 35.2

TABLE 14

TABLE 15

SUMMARY OF AERATED LAGOON COLOR, pH AND NUTRIENT RESULTS
(Mead-FWQA Project on Biological Treatment)

	TEST CONDITIONS					EDITED TEST RESULTS			
							% Reduction		
Test	Deten. Time (days)	Depth (feet)	System Feed	Organic Loading (ppd/1000cf)	(F/M Ratio)	Apparent Color	pH	NH_3-N	PO_4-P
AL-8	1.4	7.7	OD(2-3)	1.1	0.15	81.8	-3.4	-	-
AL-2	1.5	6.7	PF(1)	7.3	0.37	- 3.2	9.5	49.1	54.2
AL-9	1.7	5.5	OD(3)	0.4	0.06	-61.0	-1.6	-	-
AL-11	1.7	5.5	TF1(3)	6.2	0.65	34.3	-0.3	-12.3	-48.8
AL-12	1.8	5.0	TF2(BL)	12.1	0.59	16.6	5.9	55.5	27.9
AL-1	2.3	6.7	PF(1)	5.0	0.64	14.9	2.6	73.8	-13.0
AL-4	2.3	6.7	PF(1-2)	5.3	0.36	2.0	2.1	84.6	3.0
AL-7	2.3	6.7	PF(2)	5.0	0.30	11.1	-2.1	46.9	25.7
AL-3	3.0	6.7	PF(1)	3.6	0.23	14.9	-2.0	72.6	-119.9
AL-6	3.0	6.7	PF(2)	3.8	0.27	16.6	3.1	48.2	20.3
AL-10	3.5	7.7	PF(3)	2.3	0.07	-48.1	6.4	91.4	12.9
AL-5	3.8	6.7	PF(2)	3.6	0.53	48.8	2.3	18.2	65.6
AL-13	7.0	7.7	PF(BL)	3.4	0.13	25.6	13.6	-260.1	- 2.8

LAGOON AND DITCH WITHOUT CLARIFICATION

(Mead-FWQA Project on Biological Treatment)

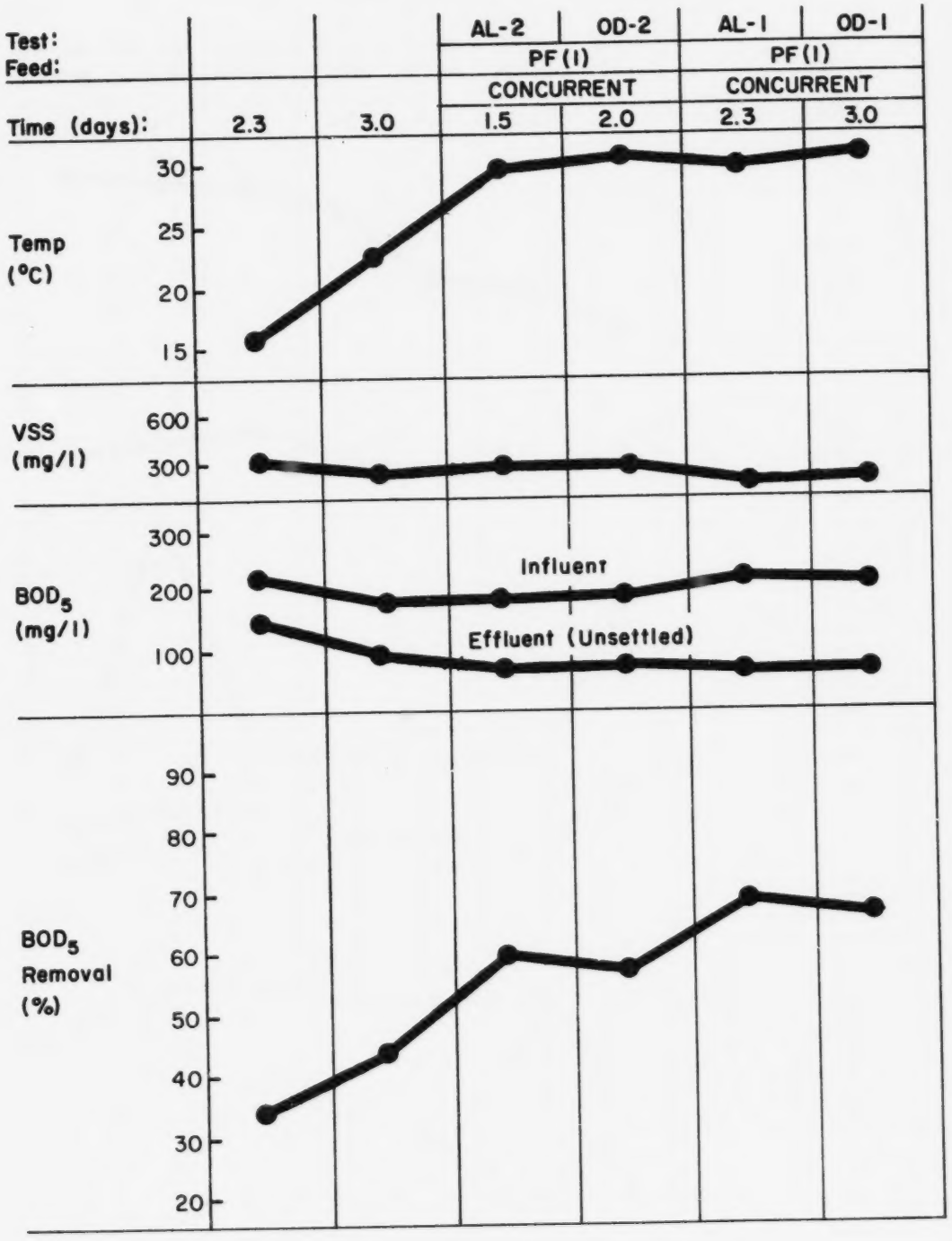


FIGURE 11

PILOT AERATED LAGOON WITH SETTLED BOD'S
(Mead-FWQA Project on Biological Treatment)

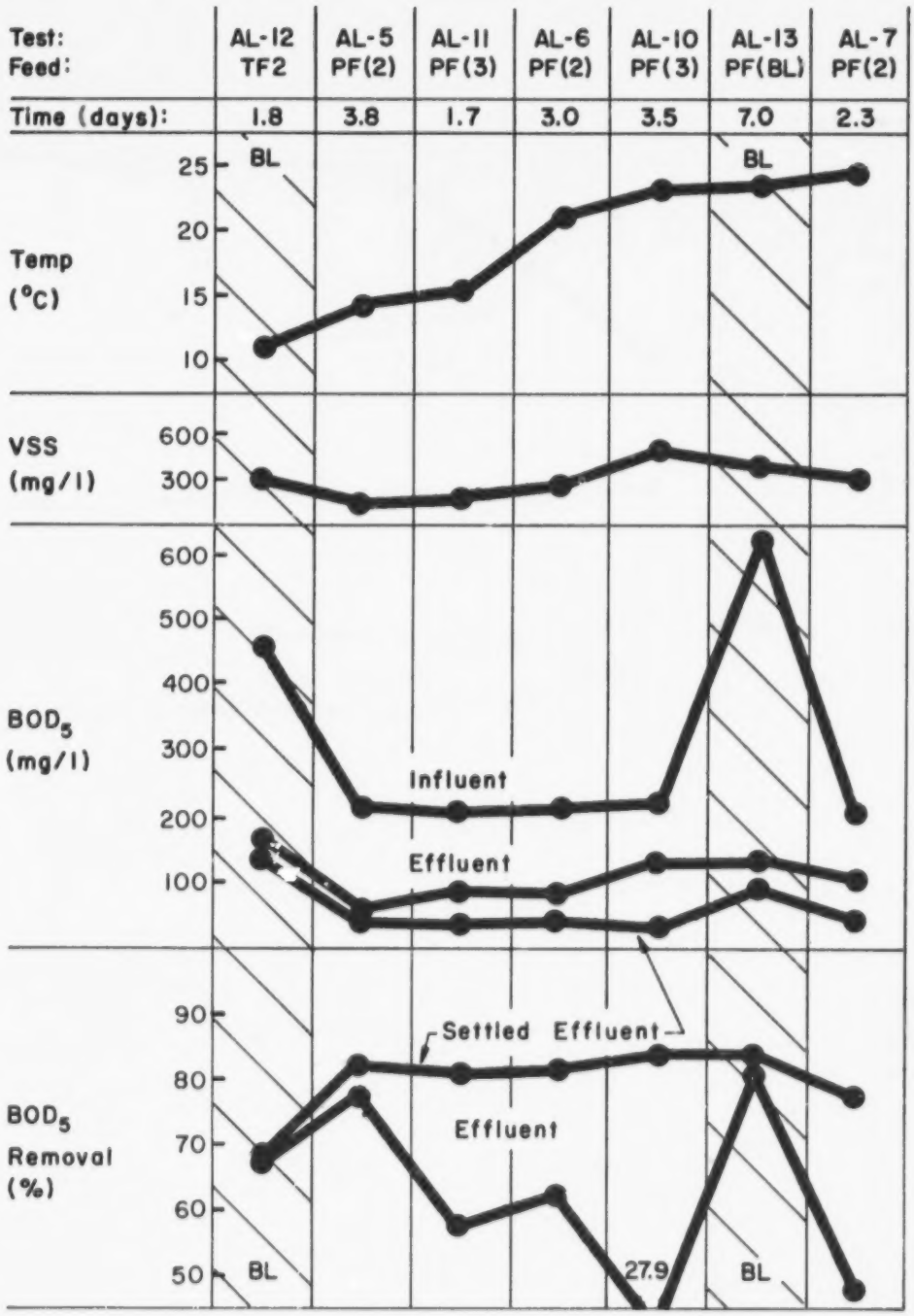


FIGURE 12

MODEL FOR PILOT AERATED LAGOON
(Mead-FWQA Project on Biological Treatment)

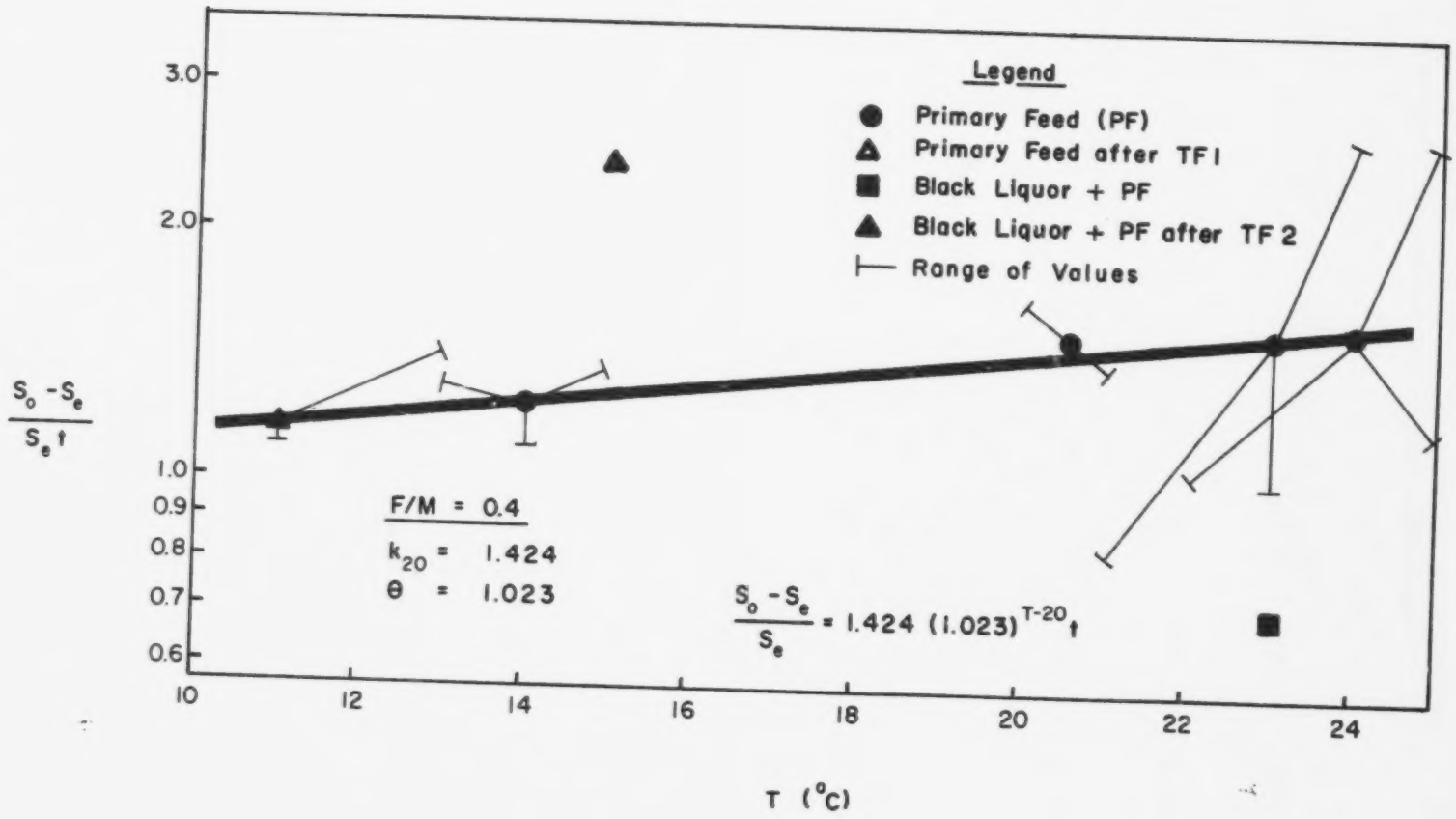


FIGURE 13

COMPARISON OF OBSERVED EFFICIENCIES AND AERATED LAGOON MODEL
(Mead-FWQA Project on Biological Treatment)

Test	Feed	BOD_5 of Effluent (mg/l)		Treatment Efficiency (%)	
		Observed	Predicted	Observed	Predicted
AL-5	PF	39	39	82.3	82.5
AL-6	PF	38	40	81.9	81.5
AL-7	PF	49	45	76.7	78.1
AL-8	OD	32	7	negative	69.5
AL-9	OD	13	2	negative	73.3
AL-10	PF	35	35	84.2	84.4
AL-11	TF1	40	65	80.7	68.8
AL-12	TF2(BL)	146	145	68.2	68.3
AL-13	PF(BL)	104	53	83.3	91.5

TABLE 16

SECTION VIII

OXIDATION DITCH TREATMENT

The Oxidation Ditch Process

The Research Institute for Public Health Engineering in The Netherlands conducted extensive research with the objective of reliable and economical means of sewage treatment for small communities. What resulted in 1957 was the oxidation ditch treatment process which is essentially an extended aeration process providing aeration in excess of 24 hours (15). For economy and simplicity, an earthen ditch in the shape of a racetrack was used for the aeration tank and air was provided by a horizontally mounted aeration rotor. Intermittent operation of the rotor permitted the ditch to serve also as the final clarifier in the first oxidation ditches.

The same effect can be accomplished by clarification of the ditch overflow and return of the settled sludge back to the aeration basin.

The oxidation ditch or extended aeration process is generally operated without controlled sludge wasting because the daily accumulation of sludge solids in the system becomes negligible for sewage when the aeration period extends beyond 18 to 24 hours. More details on the oxidation ditch process can be found in the literature (5)(9)(15).

Successful application of the oxidation ditch process has been reported in Ontario, Canada (15), Alaska (9), and other locations in the United States (10)(18) for the treatment of sewage but the process has not been employed previously in the U.S. for the treatment of kraft pulp and paper mill effluents.

The fact that excess solids might be negligible coupled with the fact that dewatering and disposal of secondary sludge solids can be an important cost in industrial effluent treatment made an evaluation of the oxidation ditch process very desirable. Its relatively long detention time should minimize the effect of shock loads and reduce the need for close control of the treatment process even on an effluent stream of highly variable composition.

Project Results on Pilot Oxidation Ditch

A total of 8 test periods with clarification and sludge return were completed on the pilot Oxidation Ditch (OD) with Clarifier 2 (CL2) during the project. Two other tests were conducted without clarification and have been discussed in SECTION V. More testing was planned but mechanical difficulties with the special chain drive arrangement on the pilot brush aerator caused several serious delays. This same type of problem would not be experienced with full-scale equipment since chain drives are no longer being used, according to the manufacturer.

The results from all test periods have been summarized on separate pages and are contained with the respective Clarifier 2 results in TABLES 94 through 111 in the APPENDIX (starting on page 185).

The test conditions have been arrayed with respect to detention time and depth. The average BOD_5 removals are shown in this format in TABLE 17 (page 62). The same format has been used to show solids changes across this OD-Clarifier 2 system in TABLE 18 (page 63) and apparent color, pH, and nutrient changes in TABLE 19 (page 64). FIGURE 14 (page 65) shows certain test parameters and BOD_5 removal arrayed with respect to temperature. These TABLES and FIGURES will be referenced in the following discussions.

BOD_5 Removals Across Pilot Oxidation Ditch Process

As can be seen in both TABLE 17 and FIGURE 14, the average BOD_5 removals for the oxidation ditch process employing sludge return were above 80 percent in all cases (except one) when PF without black liquor was feed for the system. The highest removal at 1-day detention was 86.6 percent at an average temperature of 30°C. Results from two test periods at 2-day detention exceed that average removal. They were 89.8 percent at 27°C and 93.7 percent at 29°C. The BOD_5 removal in OD appears to depend more upon temperature and detention time than expected. See mathematical model at the end of this SECTION.

The most significant fact is that the process was run with no control throughout the project once the feed rate, sludge return rate, and aerator submergence were set for a given test period. All sludge underflow from Clarifier 2 was recycled to OD. None was wasted except for the incidents relating to drainage of the OD and/or Clarifier 2 identified by date in TABLE 40 of the APPENDIX (page 130). Any buildup of excess sludge would have been lost during these failures. The question, therefore, has not been completely resolved concerning extent of sludge handling and disposal facilities still required with the oxidation ditch process on kraft wastewater.

Solids Removals Across Pilot Oxidation Ditch Process

The average solids reductions shown in TABLE 18 are based on a comparison between the feed to OD and the effluent from Clarifier 2 (except tests OD-1 and OD-2) since the solids overflowing from OD are internally maintained at a high level for the biological process. With a single unexplained exception, all measured forms of solids decreased across the OD-Clarifier 2 system.

Suspended solids reductions ranged from 13.0 percent to 83.2 percent with most ranging from approximately 50 to 67 percent. Average suspended solids levels in the treated effluent ranged from 69 to 262 mg/l when black liquor was not being added. Other solids levels can be seen on the individual test period summaries in the APPENDIX.

Apparent Color, pH, and Nutrient Change Across Pilot Oxidation Ditch

TABLE 19 summarizes the results of changes in apparent color, pH, and nutrients across the OD-Clarifier 2 system (tests OD-3 through OD-10). Apparent color (i.e., with suspended solids not removed before testing) decreased in all situations when the system feed was PF without black liquor addition. Reductions ranged from 22.7 to 69.2 percent, leaving final levels of 300 to 1350 color units in the treated effluent.

The pH changes through the treatment process were not great. Final values in all cases ranged from an average pH 7.2 to 7.8.

The OD-Clarifier 2 system was an effective process for reducing ammonia nitrogen and phosphate phosphorus. The ammonia reductions ranged from 32.2 to 95.5 with most reductions being over 75 percent. Phosphate was reduced as much as 67.6 percent over the measured levels in the feed. In one test period an average increase was recorded while in another, a 6.4 percent decrease was found. Otherwise, the removals were all above 30 percent. Additional information on nitrogen forms will be presented in SECTION VIII.

Dissolved Oxygen Levels in Pilot Oxidation Ditch

Oxygen was always maintained at average levels above 0.9 mg/l in the OD basin at the point of overflow. Lower levels probably occurred toward the bottom of the basin, especially when operated at the greater depths. Several oxygen profiles are presented in SECTION VIII.

Change in Temperature Across Pilot Oxidation Ditch

Average temperatures as shown by individual test period for OD in the APPENDIX dropped by 7°C to 12°C during treatment at the 1-day and 2-day detention times. Such decreases for a given basin and aerator are a function of ambient temperature and detention time.

Mathematical Models of Oxidation Ditch Results

The oxidation ditch data were analyzed in a manner similar to that for the aerated lagoon. FIGURE 15 (page 66) shows the graphical solution which was found to best fit these data. In this FIGURE, two graphical relationships are presented. The average food to microorganism ratio (F/M) of the system is the distinction.

One relationship is presented for an F/M ratio of 0.3. This F/M ratio is considered to be in the range for normal aerobic biological treatment design, although at the lower end. For this F/M ratio, a reaction rate constant of 3.37 and a temperature coefficient of 1.063 is indicated.

For the lower F/M ratio of 0.06 (indication of a starved condition in the biological system), a reaction rate constant of 0.92 and a temperature coefficient of 1.256 was found. As for the aerated lagoon modeling, all points in FIGURE 15 represent functions of an average of the edited data for that test period. The range over which those data extended is indicated by the lines which radiate from the respective average points.

The following equations are derived from the graphical relationship presented in FIGURE 15:

For F/M = 0.3

$$\frac{S_o - S_e}{S_e} = 3.37(1.063)^{T-20}t$$

And for

F/M = 0.06

$$\frac{S_o - S_e}{S_e} = 0.92(1.256)^{T-20}t$$

Where

S_o = BOD of influent (mg/1)

S_e = BOD of effluent (mg/1)

T = Temperature of ditch contents (°C)

t = Detention time (days)

The effluent BOD_5 to be expected from the oxidation ditch can be solved from the models and is as follows:

For F/M = 0.3

$$S_e = \frac{S_o}{1+3.37(1.063)^{T-20}t}$$

And for

F/M = 0.06

$$S_e = \frac{S_o}{1+0.92(1.256)^{T-20}t}$$

The temperature coefficient is therefore found to decrease as the F/M ratio increases from 0.06 to 0.3. This variance is probably due to changes in the individual biological particles. When the F/M ratio is in the neighborhood of 0.3, the particles are more flocculant and, as previously discussed, the rate of oxygen diffusion into the flocculant particle becomes the more limiting factor. In the case of extremely low

F/M ratios and very high F/M ratios, a dispersed growth condition exists and the influence of temperature is more direct on the individual organism and its biokinetics rather than on the more physical aspect of oxygen diffusion.

In addition, the large θ value for the low F/M ratio is undoubtedly influenced by factors other than the biokinetic rate as it is doubtful that biokinetics alone could account for such a large θ value. Other influences certainly include the fact that the BOD values are based on settled rather than filtered samples.

A single point with an F/M ratio of approximately 1 is shown about midway between the two plots presented in FIGURE 15. The location of this point might tend to indicate that as the F/M ratio increases to 1 or above, a more dispersed growth condition is realized and subsequently the temperature effect upon the biokinetics of the system becomes more pronounced. In all cases, the F/M values are based on mixed liquor volatile suspended solids, which are suspected of containing a large portion of non-biological volatile solids such as cellulose, and for that reason should not be construed as absolute F/M values.

TABLE 20 (page 67) presents the observed efficiencies and effluent BOD concentrations compared to those levels which would be predicted by the respective models just presented. These models should be applied on the basis of the F/M ratios indicated. As can be seen, the correlation is quite high. It should be re-emphasized at this point that the data used in developing these models, as well as those for the other biological systems and the analysis of those models was based on settled BOD data whereas filtered BOD data have been more generally employed by others for such mathematical modeling and model comparisons.

TABLE 17

SUMMARY OF OXIDATION DITCH BOD_5 RESULTS
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS: Deten. Time (days)	Depth (feet)	System Feed	Organic Loading (ppd/1000cf)	Organic Loading (F/M Ratio)	EDITED TEST RESULTS: Temp. (°C)	% BOD_5 Reduction: Unit Mixed	Unit Settled	Overall	Settled Effluent BOD_5 (mg/l)
OXIDATION DITCH TESTS WITHOUT CLARIFICATION										
OD-2	2	7.0	PF(1)	6.2	0.36	31	57.3	-	-	81
OD-1	3	6.7	PF(1)	4.4	0.44	31	67.0	-	-	72
OXIDATION DITCH TESTS WITH CLARIFICATION AND SLUDGE RECYCLE										
OD-4	1	4.0	PF(2)	15.4	1.04	21	-	64.7	-	77
OD-6	1	5.2	PF(2-3)	12.4	0.14	30	-	86.6	-	29
OD-3	1	7.0	PF(1-2)	12.7	0.33	23	-	80.0	-	46
OD-5	2	4.0	PF(2)	6.5	0.04	24	-	81.4	-	39
OD-9	2	4.3	TF2(BL)	13.3	0.33	16	-	85.1	85.6	88
OD-10	2	4.3	TF1(BL)	8.5	0.09	22	-	75.5	89.5	65
OD-7	2	5.2	PF(3)	6.2	0.06	29	-	93.7	-	12
OD-8	2	8.6	PF(3)	6.0	0.05	27	-	89.8	-	19

SUMMARY OF OXIDATION DITCH SOLIDS RESULTS
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS					EDITED TEST RESULTS			
						% Solids Reduction			
	Deten. Time (days)	Depth (feet)	System Feed	Organic Loading (ppd/1000cf)	(F/M Ratio)	Total	Volatile Total	Suspended	Volatile Suspended
OXIDATION DITCH TESTS WITHOUT CLARIFICATION									
OD-2	2	7.0	PF(1)	6.2	0.36	- 5.4	5.2	-37.0	-83.7
OD-1	3	6.7	PF(1)	4.4	0.44	8.6	14.4	-49.4	-43.8
OXIDATION DITCH TESTS WITH CLARIFICATION AND SLUDGE RECYCLE									
OD-4	1	4.0	PF(2)	15.4	1.04	22.7	24.5	48.9	14.1
OD-6	1	5.2	PF(2-3)	12.4	0.14	26.9	45.9	83.2	75.8
OD-3	1	7.0	PF(1-2)	12.7	0.33	- 3.4	8.5	64.6	53.6
OD-5	2	4.0	PF(2)	6.5	0.04	13.2	31.0	13.0	9.1
OD-9	2	4.3	TF2(BL)	13.3	0.33	36.7	52.2	27.0	47.8
OD-10	2	4.3	TF1(BL)	8.5	0.09	16.3	25.5	38.0	46.1
OD-7	2	5.2	PF(3)	6.2	0.06	27.0	41.8	64.7	50.9
OD-8	2	8.6	PF(3)	6.0	0.05	22.2	36.7	67.0	48.3

TABLE 18

TABLE 19

SUMMARY OF OXIDATION DITCH COLOR, pH AND NUTRIENT RESULTS
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS: Deten. Time (days)	Depth (feet)	System Feed	Organic Loading (ppd/1000cf)	Organic Loading (F/M Ratio)	EDITED TEST RESULTS: Apparent Color	% Reduction: pH	% Reduction: NH_3-N	% Reduction: PO_4-P
OXIDATION DITCH TESTS WITHOUT CLARIFICATION									
OD-2	2	7.0	PF(1)	6.2	0.36	- 3.5	9.2	16.9	-12.7
OD-1	3	6.7	PF(1)	4.4	0.44	5.3	2.3	74.2	-21.6
OXIDATION DITCH TESTS WITH CLARIFICATION AND SLUDGE RECYCLE									
OD-4	1	4.0	PF(2)	15.4	1.04	31.9	5.0	75.4	67.6
OD-6	1	5.2	PF(2-3)	12.4	0.14	27.4	0.1	81.8	30.2
OD-3	1	7.0	PF(1-2)	12.7	0.33	57.3	1.2	85.9	59.2
OD-5	2	4.0	PF(2)	6.5	0.04	22.7	-0.5	32.2	42.2
OD-9	2	4.3	TF2(BL)	13.3	0.33	50.3	13.2	81.5	6.4
OD-10	2	4.3	TF1(BL)	8.5	0.09	4.3	5.8	52.3	56.4
OD-7	2	5.2	PF(3)	6.2	0.06	68.2	1.6	95.0	- 2.8
OD-8	2	8.6	PF(3)	6.0	0.05	69.2	8.6	95.5	60.4

PILOT OXIDATION DITCH WITH SLUDGE RETURN

(Mead-FWQA Project on Biological Treatment)

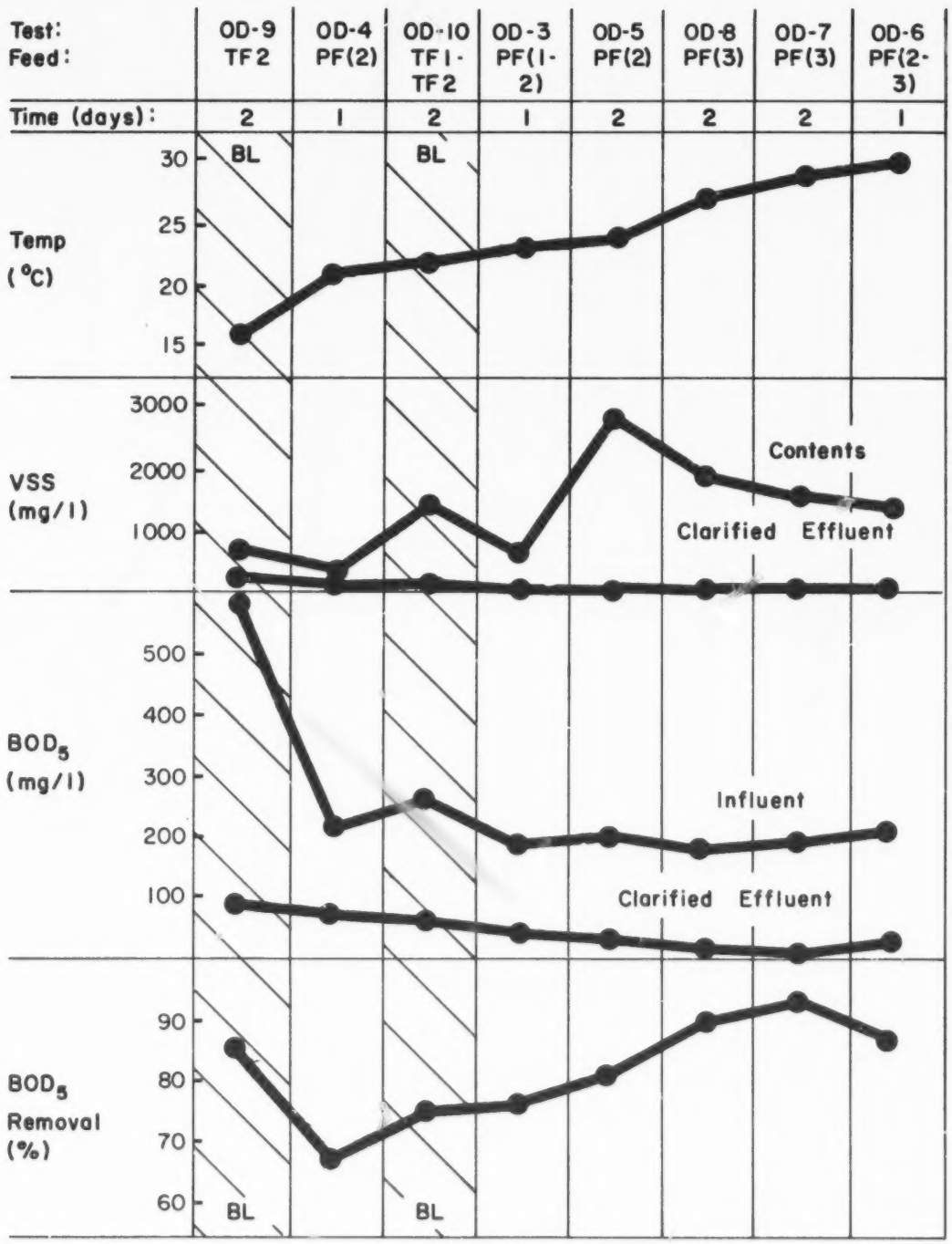
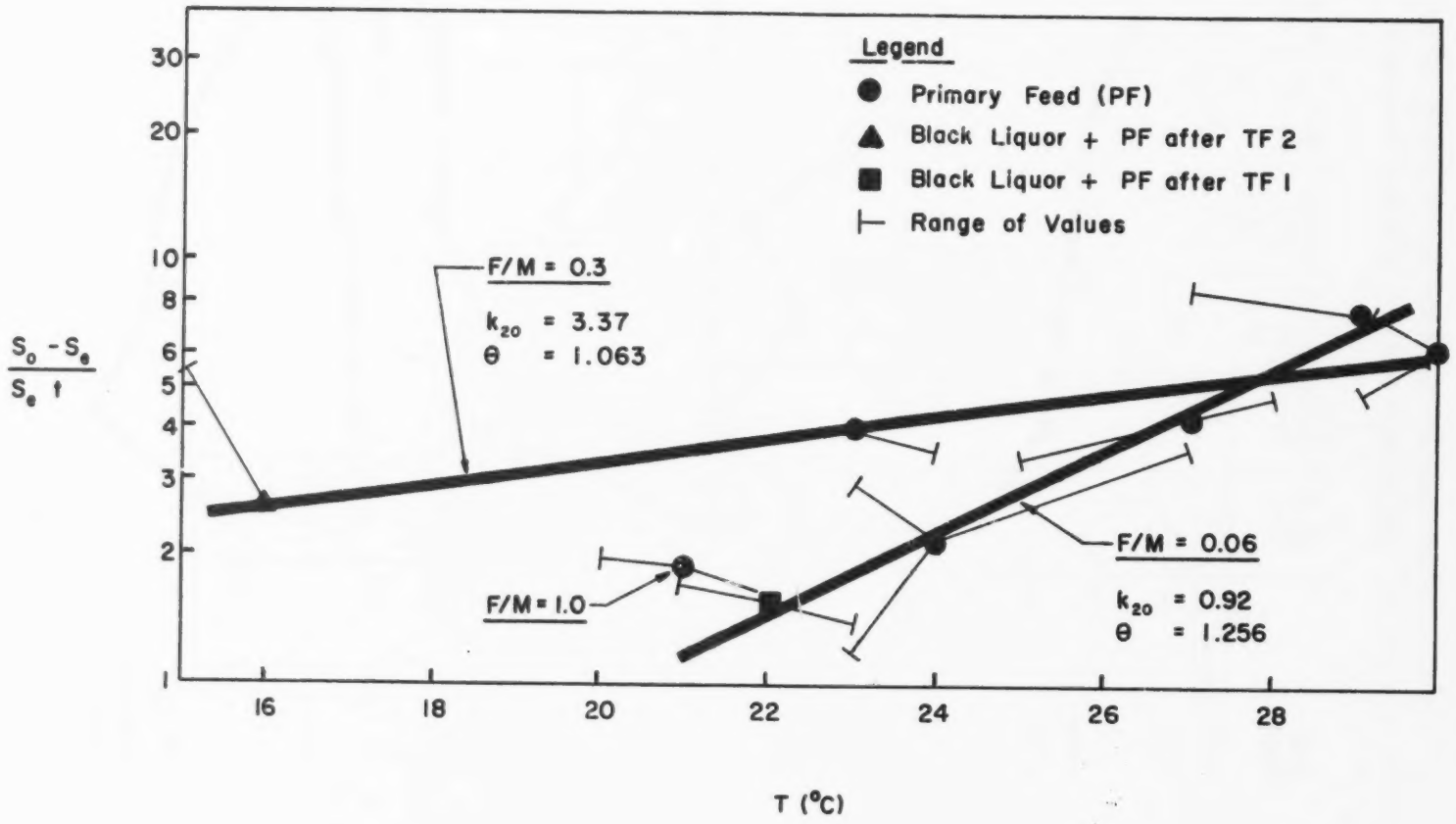


FIGURE 14

FIGURE 15

MODEL FOR PILOT OXIDATION DITCH
(Mead-FWQA Project on Biological Treatment)



COMPARISON OF OBSERVED EFFICIENCIES AND OXIDATION DITCH MODEL
(Mead-FWQA Project on Biological Treatment)

Test	F/M	Feed	BOD_5 of Effluent (mg/l) Observed	BOD_5 of Effluent (mg/l) Predicted	Treatment Efficiency(%) Observed	Treatment Efficiency(%) Predicted
OD-3	0.33	PF	46	45	80.0	80.3
OD-6	0.14	PF	29	30	86.6	86.0
OD-9	0.33	TF2(BL)	88	89	85.1	84.2
OD-5	0.04	PF	39	38	81.4	81.8
OD-7	0.06	PF	12	13	93.7	93.5
OD-8	0.05	PF	19	18	89.8	90.3
OD-10	0.09	TF1 (BL)	65	68	75.5	74.5
OD-4	1.00	PF	77	-	64.7	-

TABLE 20

SECTION IX

COMBINATION TREATMENT

Alternates for Combination Treatment

Flexibility was designed into the pilot treatment plant facilities in order to allow multiple combinations of treatment units in series as well as parallel operation. FIGURES 16 through 22 give schematic representations of the ALTERNATES which were run during the project. Other combinations were also possible. Results from the parallel operation of all units as shown in ALTERNATE A have been discussed in the three previous SECTIONS. Combination test results will now be presented.

Nine combination test series were run during the project from which 12 separate combination tests can be identified as having mill clarified effluent (called pilot feed or PF) for the system influent source. The separate series by ALTERNATE with pilot unit sequence and test identification were as follows:

ALTERNATE B - Trickling Filter to Aerated Lagoon (see FIGURE 17, page 76)

B-1 (involves TF1):	TF1-16 to AL-11
B-2 (involves TF2):	TF2-17 to AL-12

ALTERNATE C - Trickling Filter to Oxidation Ditch (see FIGURE 18, page 77)

C-2 (involves TF2):	TF2-17 to OD-9
C-3 (involves both TF's):	TF2-18 to TF1-18 to OD-10

ALTERNATE D - Oxidation Ditch to Trickling Filter (see FIGURE 19, page 78)

D-2 (involves TF2):	OD-8 to TF2-15

ALTERNATE E - Oxidation Ditch to Aerated Lagoon (see FIGURE 20, page 79)

E	OD-6to AL-8
E	OD-7 to AL-9

ALTERNATE F - Trickling Filters in Series (see FIGURE 21, page 80)

F-1 (TF1 first)	TF1-11 to TF2-11
F-1	TF1-14 to TF2-14
F-2 (TF2 first)	TF2-13 to TF1-13
F-2	TF2-18 to TF1-18

ALTERNATE G - Trickling Filter to Oxidation Ditch to Trickling Filter (see FIGURE 22, page 81)

G	TF2-17 to OD-9 to TF1-17

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The separate test period summaries in the APPENDIX contain the individual unit results and show the "overall" BOD efficiencies for combination treatment where applicable. The edited average values of efficiency have been tabulated for each system and have all been presented in the previous SECTIONS (See TABLES 5, 8, 13 and 17). Again, the notation of "overall efficiency" is for combination treatment.

Both regular PF and black-liquor-dosed PF were used as feed depending upon the test. The black-liquor-dosed feed will be indicated by (BL).

The following discussion will be limited to the BOD removal capability of biological units following other biological units and the overall removal actually demonstrated.

Aerated Lagoon Preceded by Trickling Filter

The pilot Aerated Lagoon (AL) was preceded first by Trickling Filter 1 (TF1) and later in a second test by Trickling Filter 2 (TF2). Black liquor was being added in the second sequence. Average BOD_5 removals for the two edited test periods were as follows:

Conditions of AL Feed Unit				AL Results			Overall
I.D.	Recycle	gpd/sf	BOD_5 Removal	Temp	Time	BOD_5 Removal	BOD_5 Removal
TF1-16	0	6000	36.4%	15°C	1.7d	80.7%	85.8%
TF2-17(BL)	0	6000	13.0%	11°C	1.8d	68.2%	74.1%

In both cases, AL was able to significantly reduce the BOD load being fed to it from the roughing trickling filters. The first combination produced an effluent quality that was surpassed only by a detention time of at least 3 days and higher temperatures in AL if used alone. The second combination when black liquor was being added doesn't have a good basis for comparison using AL alone. The other test on AL during the presence of black liquor was at a detention time of 7 days and did give a better efficiency than the TF-AL combination (compare final effluent quality of 146 mg/l in combination test to 104 mg/l in test AL-13).

Oxidation Ditch Preceded by Trickling Filter

The pilot Oxidation Ditch (OD) with Clarifier 2 was preceded by TF2 in two different tests, both of which were run when black liquor was being added. The second test had both filters ahead of OD. The average BOD_5 removals for the two edited test periods were as follows:

Conditions of OD Feed Unit				OD Results			Overall
I.D.	Recycle	gpd/sf	BOD_5 Removal	Temp	Time	BOD_5 Removal	BOD_5 Removal
TF2-17(BL)	0	6000	13.0%	16°C	2d	85.1%	85.6%
TF2 & TF1(BL)	1:1	6000	56.9%	22°C	2d	75.5%	89.5%

In both these cases, OD with Clarifier 2 was able to significantly reduce the BOD load being fed to it from the roughing trickling filters. In the first combination little was accomplished by the roughing filter, although the effect to the further treatability of the effluent may have been significant since OD was able to remove 85.1 percent of the remaining BOD at the low temperature of 16°C even though other results showed OD to be very temperature sensitive. A better basis for comparison would be desirable. In the second combination, OD removed less BOD but contributed to a higher overall removal since the filters in series had done so well on the black-liquor-dosed wastewater. Final treated effluent BOD_5 concentrations for the two combination tests were 88 mg/l and 65 mg/l, respectively.

Trickling Filter Preceded by Oxidation Ditch

TF2 was preceded by OD in one test period when black liquor was not being added. Average BOD_5 removals for the single test period are as follows:

Conditions of TF2 Feed Unit				TF2 Results			Overall
I.D.	Temp	Time	BOD_5 Removal	Recycle	gpd/sf	BOD_5 Removal	BOD_5 Removal
OD-8	27°C	2d	89.8%	0	6000	11.8%	90.4%

These TF2 results are plotted along with other trickling filter combinations in FIGURE 23 (see page 82).

In this single case, the polishing filter was able to remove an additional 11.8 percent of the BOD_5 even though the OD-Clarifier 2 system had already achieved an 89.8 percent removal. The overall removal of 90.4 percent produced a final effluent quality of 16 mg/l BOD_5.

Aerated Lagoon Preceded by Oxidation Ditch

Two test series were attempted in which treated effluent from the OD-Clarifier 2 system was fed to AL. A little over 3 months, consecutively, were spent on this combination but the BOD_5 content in the lagoon effluent never equilibrated with the low level being fed from OD. (Immediately prior to this combination, AL had received a much higher loading which never got treated and/or diluted out completely.) In the two test series, the BOD_5 contents of the OD clarified effluent were 29 mg/l and 12 mg/l, respectively, compared to edited test averages from AL of 32 mg/l and 13 mg/l, respectively. No doubt the placing of a lagoon following the oxidation ditch process would result in a more stabilized effluent than could be demonstrated in this project. It is very doubtful that supplemental aeration would be required in such a lagoon.

Trickling Filters in Series

The tests about to be reported are not comparable to conventional high-rate filters in series because TF1 always operated with Clarifier 1 (except test TF1-16 which was not a combination test) and the recycle to TF1 was settled sludge, whereas TF2 was of conventional design with filtrate recycle only. Therefore, when TF1 came first, as in ALTERNATE F-1, the wastewater was clarified midway in treatment and again at the end of treatment since TF2 effluent samples were settled prior to BOD_5 determinations. When TF2 came first in series, only the final treated effluent received clarification after passing through both filters.

Two test series were conducted in which TF1 was the feed for TF2. An additional two test series were conducted in which TF2 fed TF1. One of the latter tests was run while black liquor was being added to PF. In all combination tests with both filters, the operating parameters for the two filters were kept the same for a given test period.

These parameters, along with BOD_5 removals, were as follows:

Feed I.D.	TF Conditions Recycle	gpd/sf	Feed Unit BOD_5 Removal	Second Unit BOD_5 Removal	Overall BOD_5 Removal
TF1-11	1:1	4000	68.6%	6.7%	70.7%
TF1-14	1:1	4000	50.6%	69.1%	84.7%
TF1-13	1:1	4000	41.4%	48.7%	63.8%
TF2-18(BL)	1:1	6000	42.1%	34.6%	56.9%

The second unit results are plotted along with other trickling filter combinations in FIGURE 23. In only one case of the filters in series did the second unit not perform on an almost equal basis with the first unit. The combination significantly improved BOD quality in the other three cases. The respective final treated effluent BOD_5 levels were 58, 31, 87, and 273 mg/l.

Trickling Filter Preceded by Trickling Filter-Oxidation Ditch Combination

A single test with three units in series was conducted through the final phase of the project when black liquor was being added to the pilot plant feed. This test period had TF1 on the end of the TF2-OD combination reported earlier in this SECTION.

Essentially no additional BOD was removed by TF1 when this unit followed the TF2-OD system. These TF1 results are plotted along with other trickling filter combinations in FIGURE 23.

Applicability of Mathematical Models to Combination Treatment

The models presented in previous SECTIONS of this report were developed for the particular pilot units when the influent feed source was PF without supplemental black liquor and without previous biological treatment.

These conditions force a limitation on the applicability of each model. Therefore, combination treatment which involves one pilot unit receiving the partially-treated effluent from another of the pilot units may not correlate to the models. There are, however some cases of high correlation for these situations.

The oxidation ditch model, for example, appears to hold where the effluent is first subjected to single-stage or even 2-stage trickling filtration when black liquor is present. (See tests OD-9 and OD-10.) However, such an extrapolation is unjustified based of the limited information.

The aerated lagoon model did not respond well to any feed which had received previous treatment, except in the case where the PF had been supplemented with black liquor and subjected to trickling filtration prior to the aerated lagoon. In a parallel instance where the unsupplemented PF was subjected to trickling filtration prior to the aerated lagoon, the agreement between that observed and that predicted is not good.

With respect to the trickling filters there is some indication that the agreement between that which was observed and that predicted by the models for feeds other than PF is reasonable at least part of the time, but not always. For this reason, use of the model for any application other than with PF as feed would appear unwise.

The general limitation of the mathematical models to the pilot feed source for which they were developed is not intended to indicate that a combination model could not be developed, but only that the data which were gathered during the course of the project were not sufficient to develop other dependable models.

SCHEMATIC DIAGRAM OF PILOT TREATMENT PLANT
(Mead-FWQA Project on Biological Treatment)

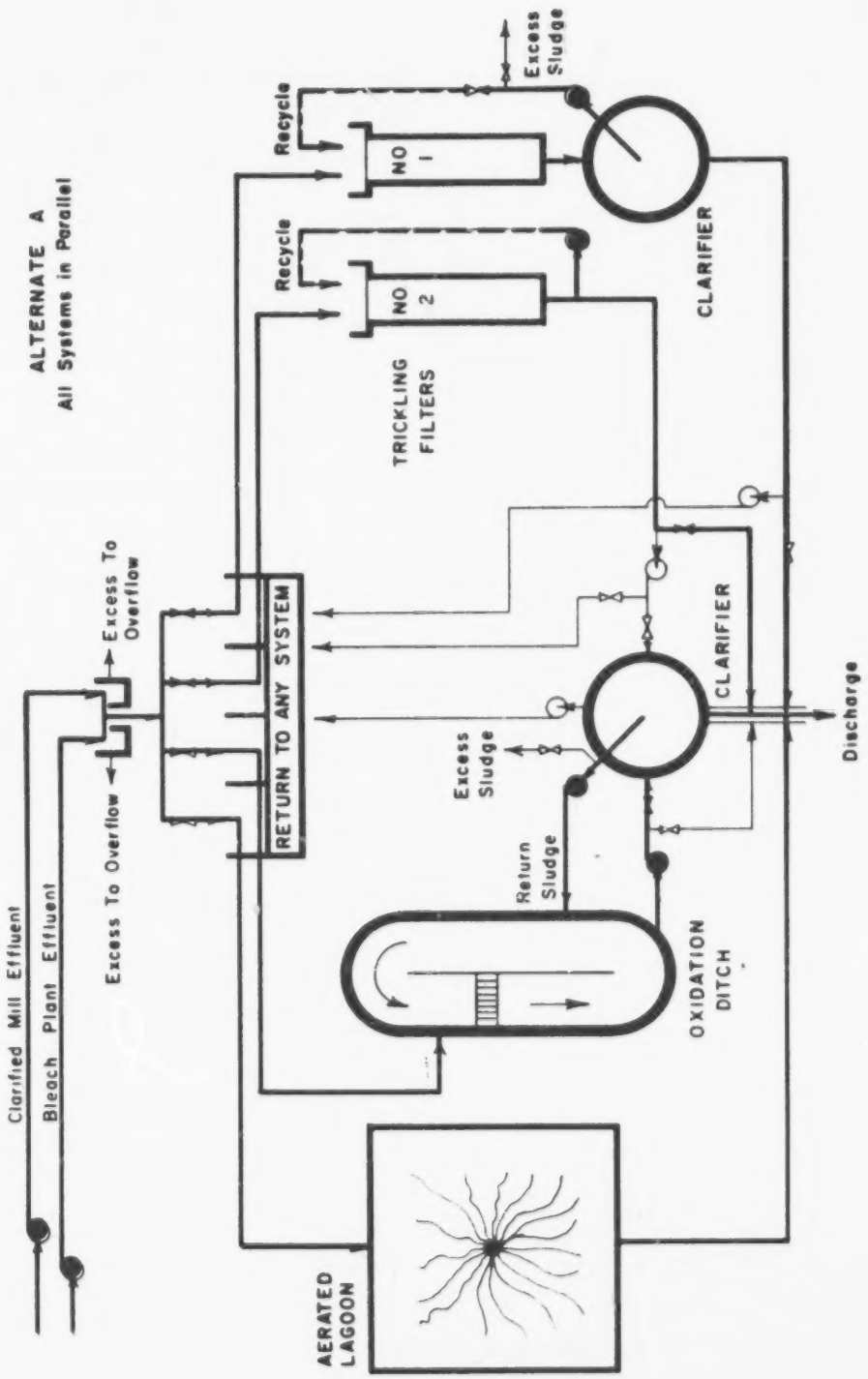

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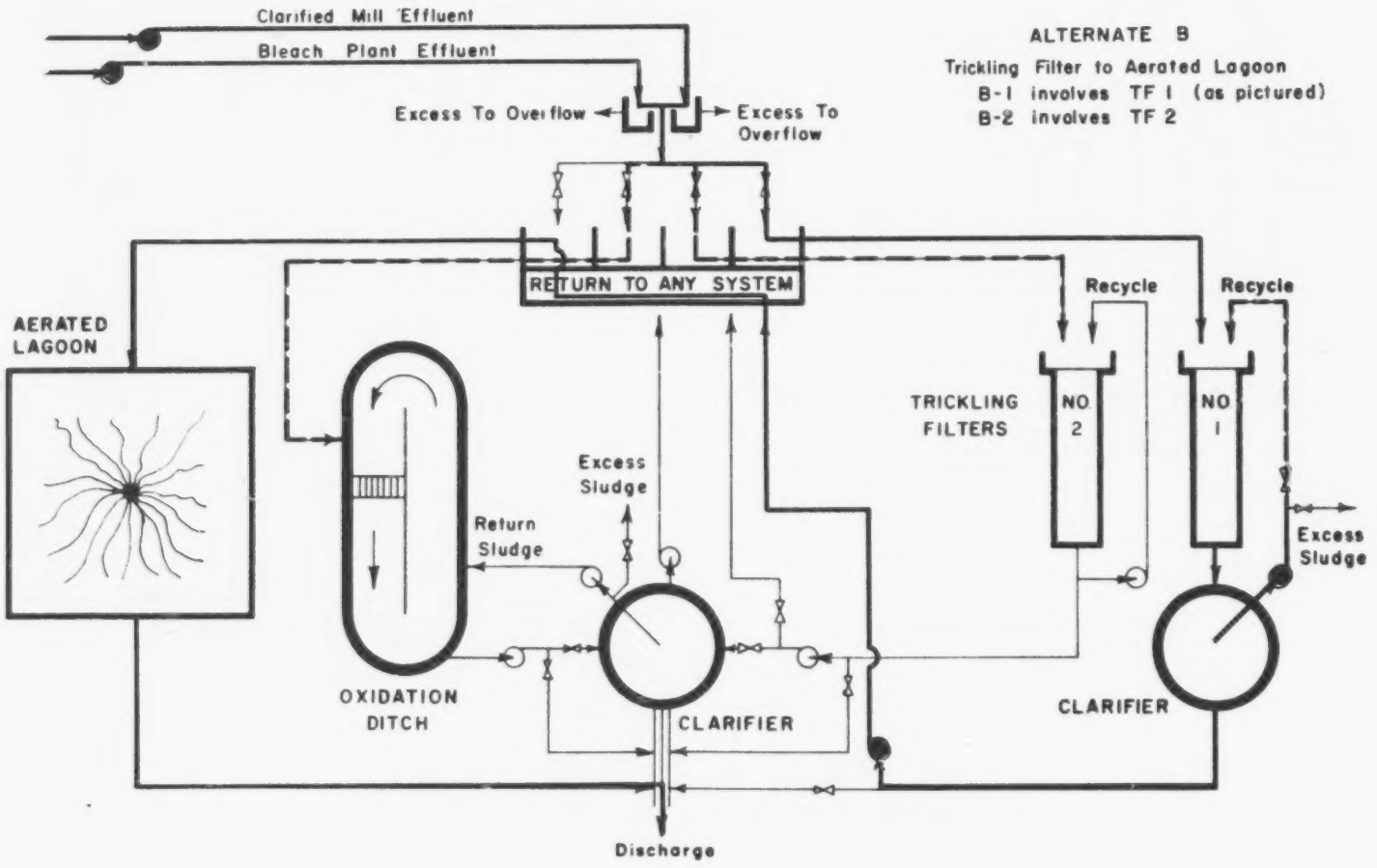
FIGURE 16

FIGURE 17

SCHEMATIC DIAGRAM OF PILOT TREATMENT PLANT
(Mead-FWQA Project on Biological Treatment)



SCHEMATIC DIAGRAM OF PILOT TREATMENT PLANT
(Mead-FWQA Project on Biological Treatment)

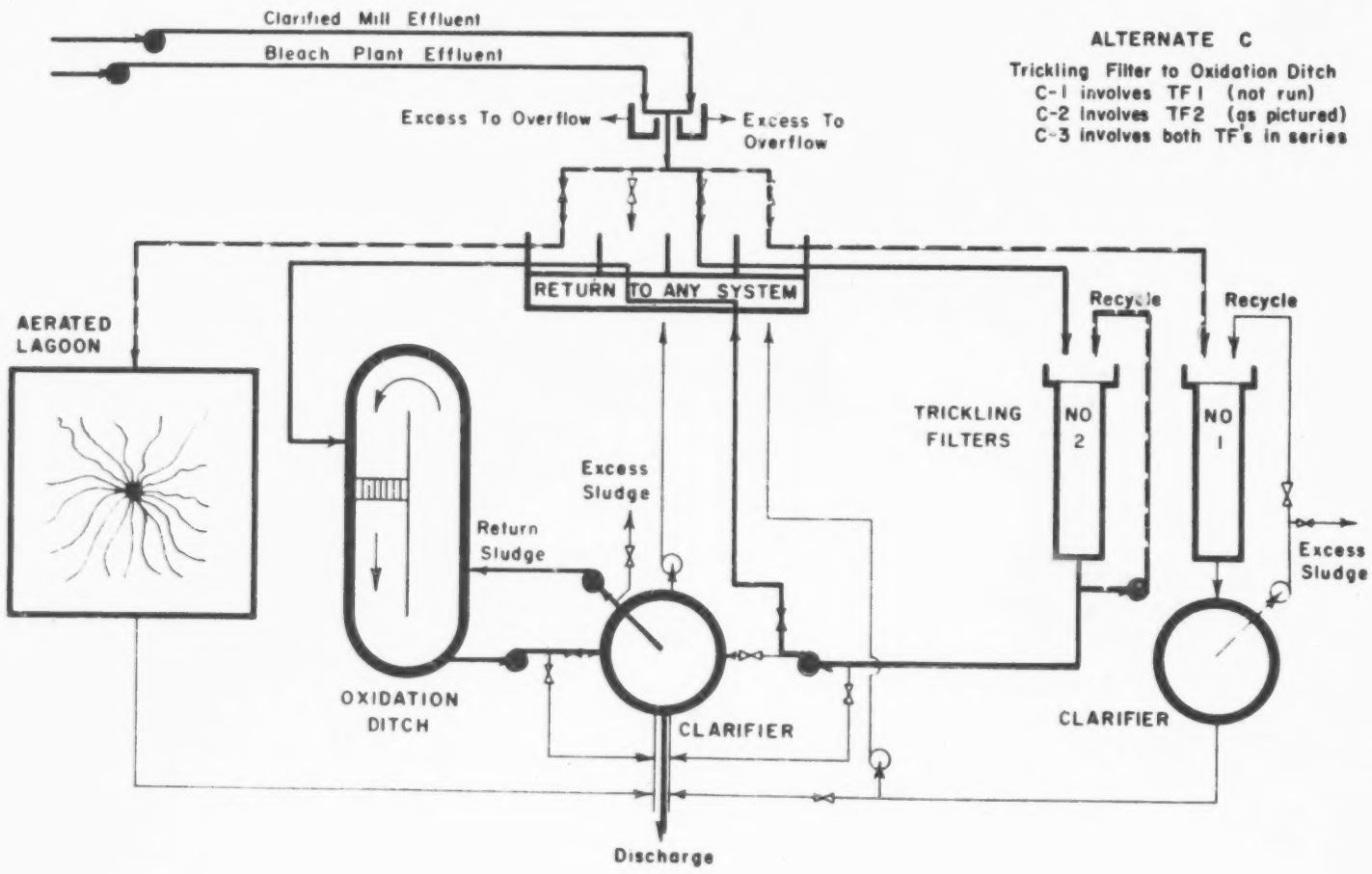
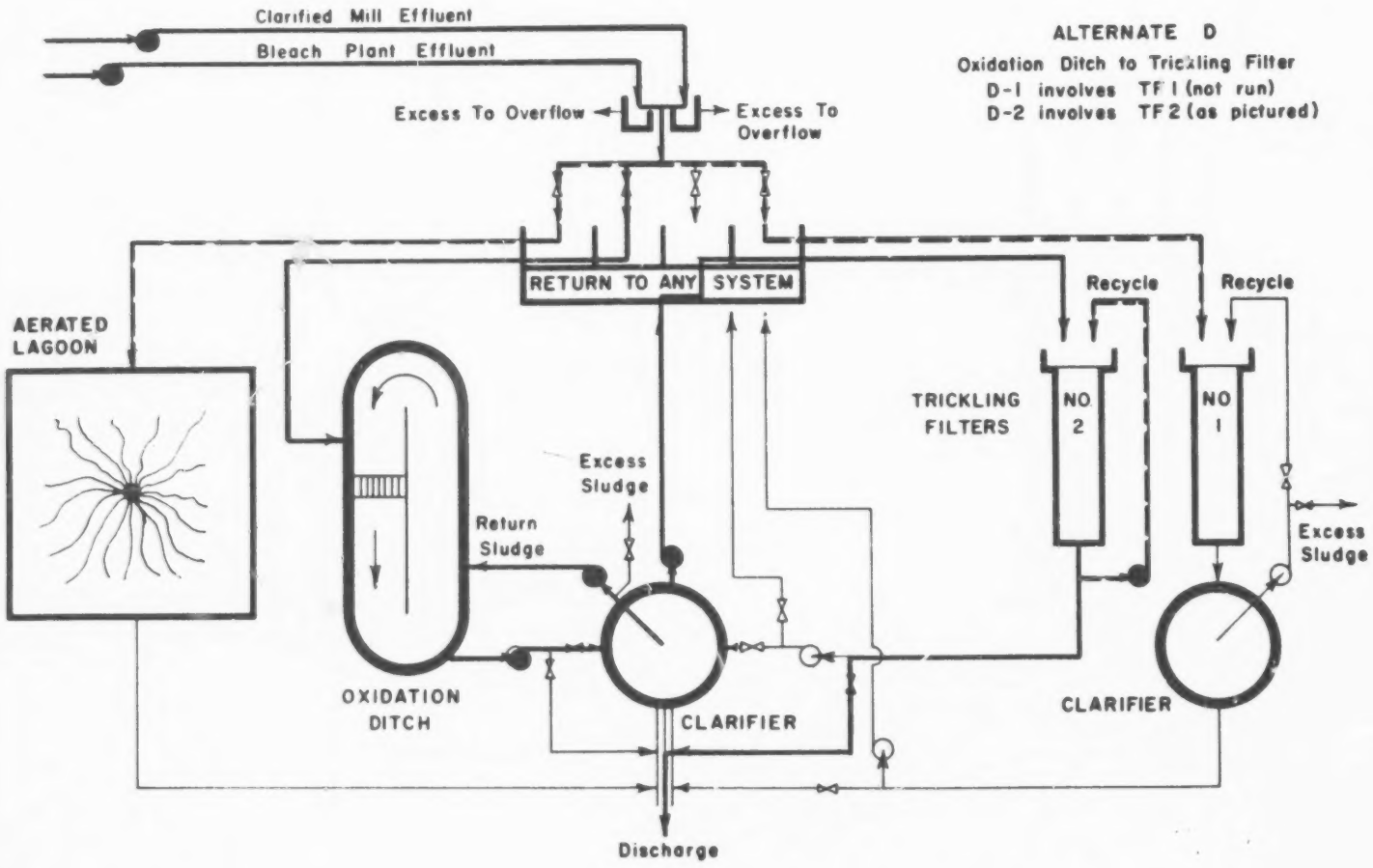


FIGURE 18

FIGURE 19

SCHEMATIC DIAGRAM OF PILOT TREATMENT PLANT
(Mead-FWQA Project on Biological Treatment)



SCHEMATIC DIAGRAM OF PILOT TREATMENT PLANT
(Mead-FWQA Project on Biological Treatment)

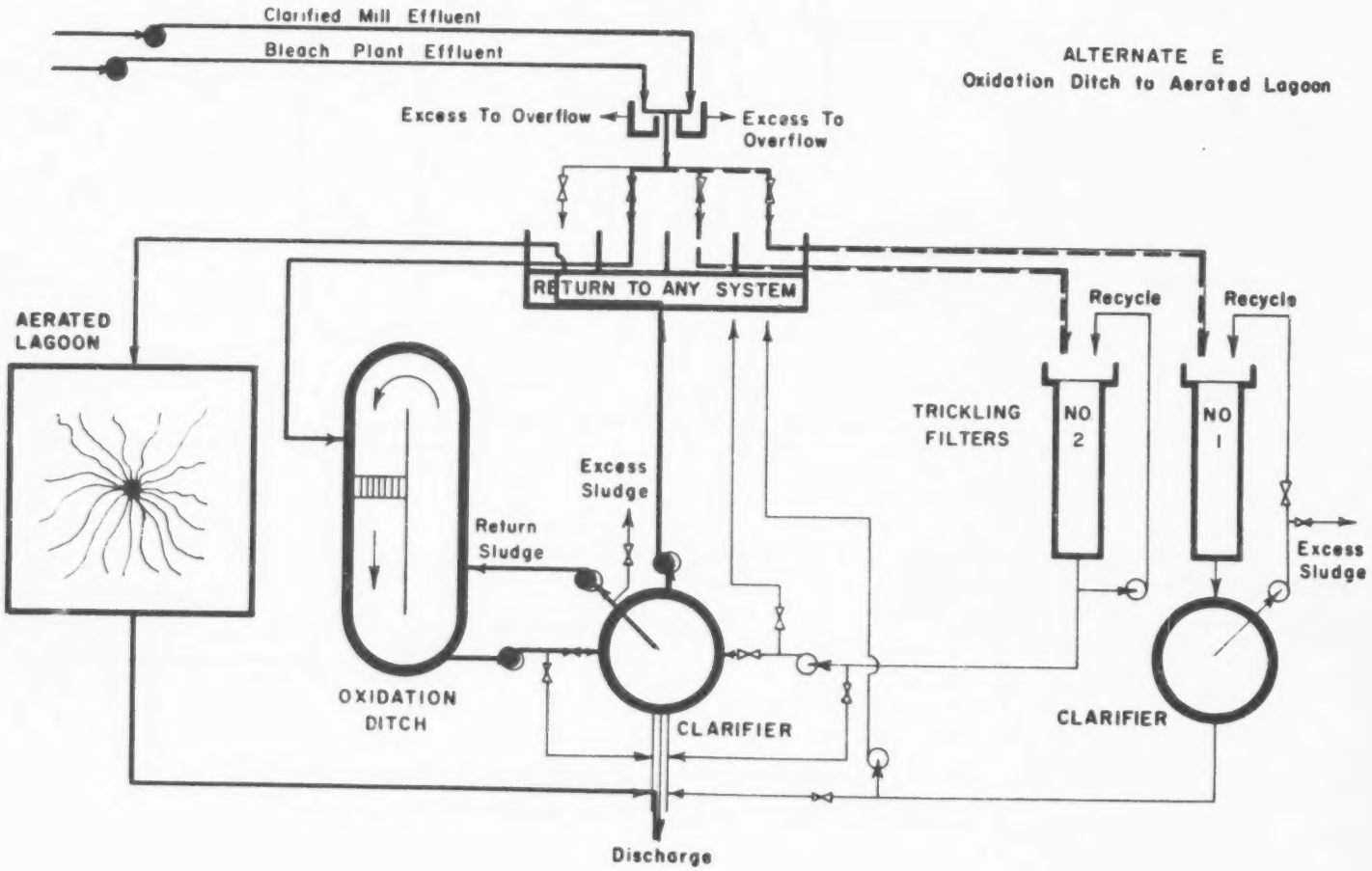
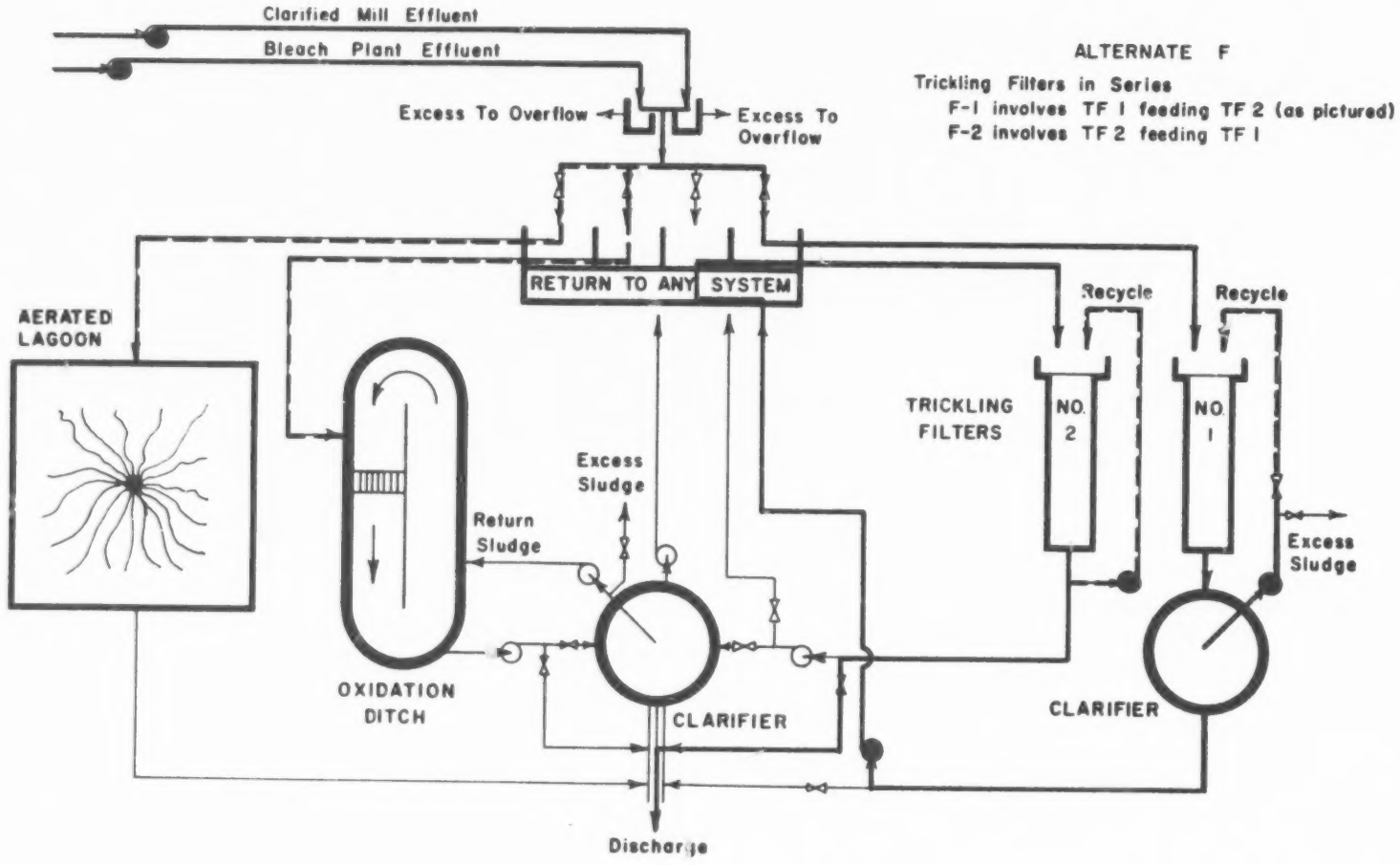


FIGURE 20

FIGURE 21

SCHEMATIC DIAGRAM OF PILOT TREATMENT PLANT
(Mead-FWQA Project on Biological Treatment)



SCHEMATIC DIAGRAM OF PILOT TREATMENT PLANT
(Mead-FWQA Project on Biological Treatment)

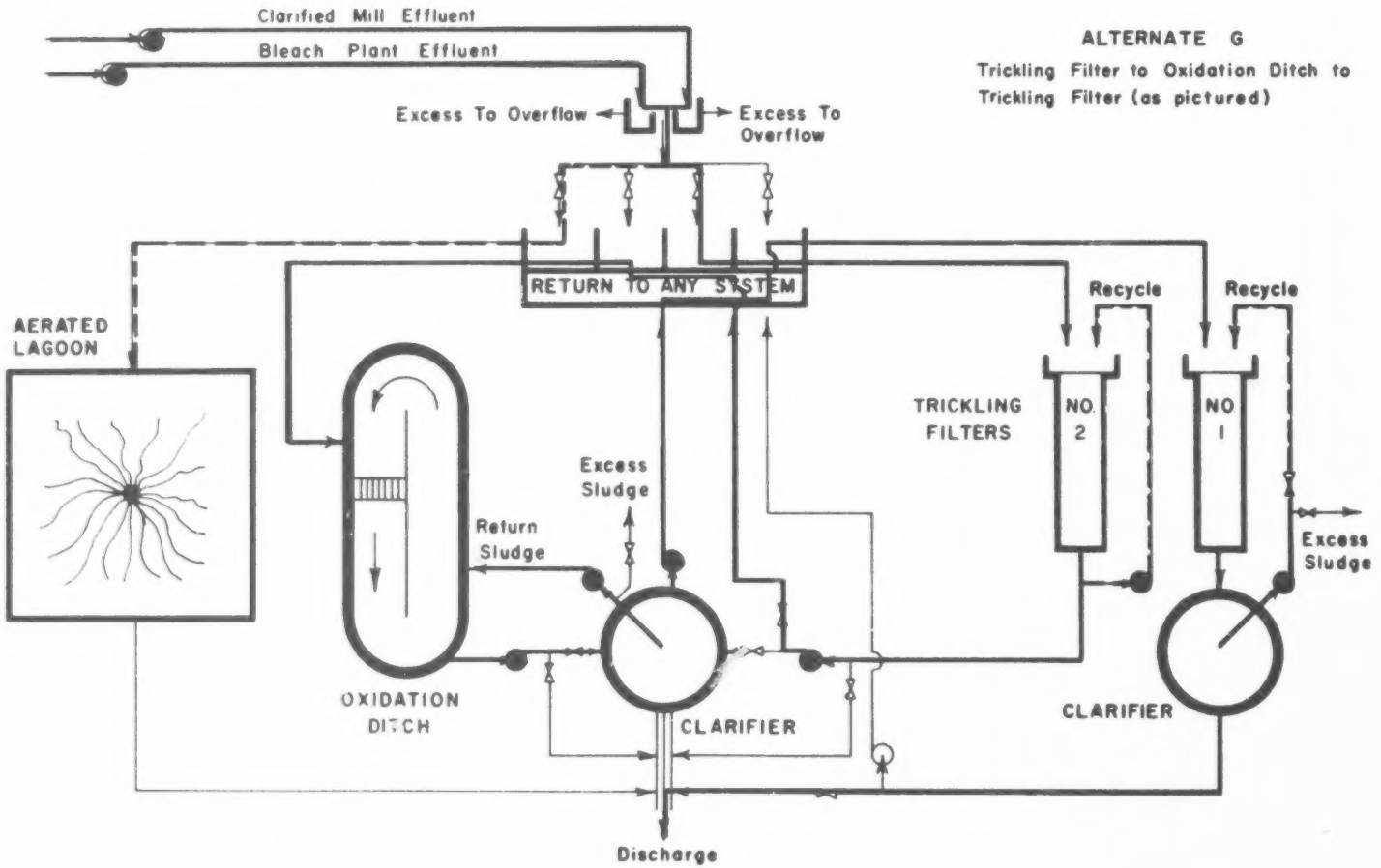


FIGURE 22

TRICKLING FILTERS PRECEDED BY TREATMENT
(Mead-FWQA Project on Biological Treatment)

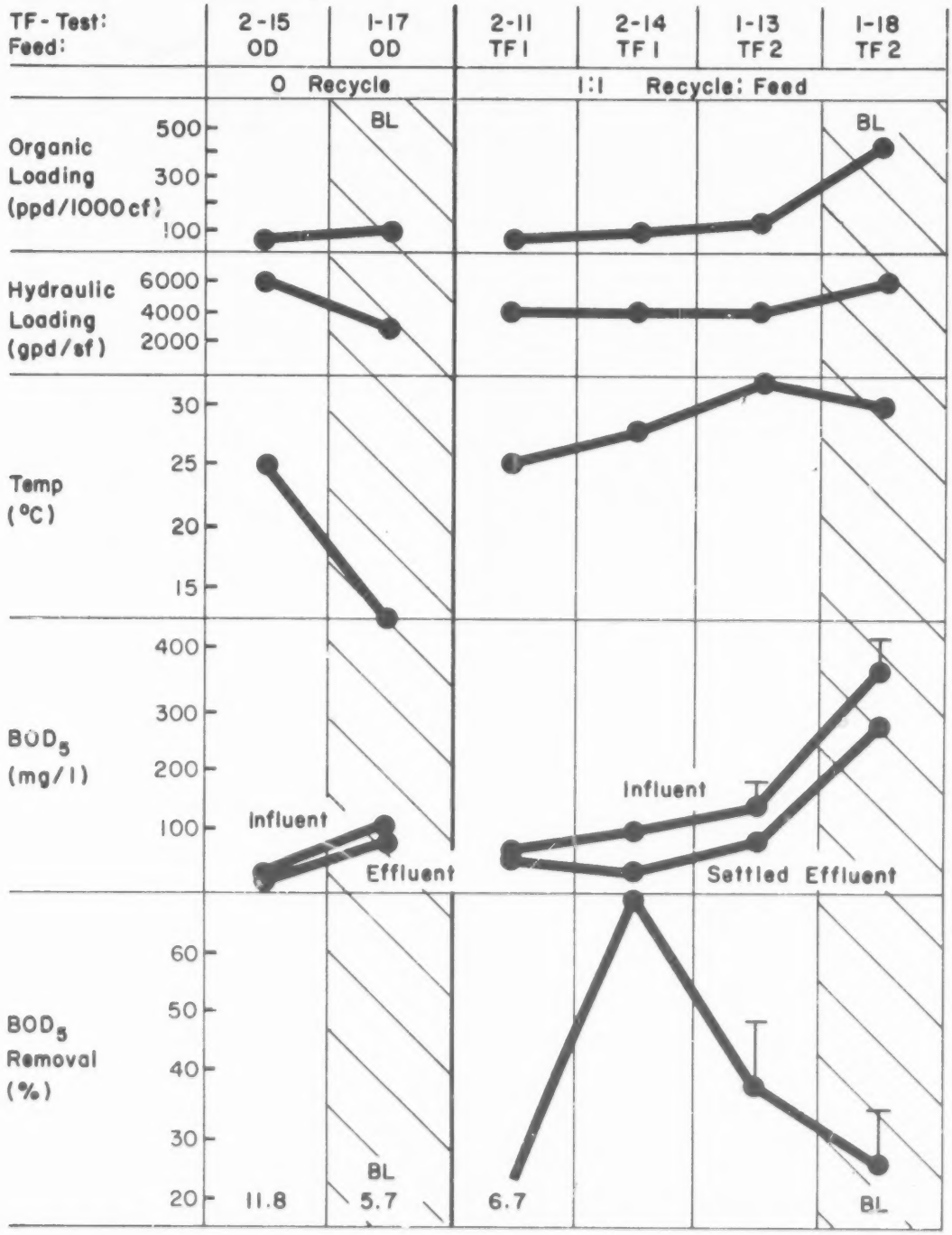


FIGURE 23

SECTION X

SUPPORT STUDIES

Aeration and Mixing in Aeration Basins

Surface aerators of the two types used in this project agitate as well as oxygenate the basin contents. The degree of agitation or mixing is a function of the power input to the basin but also depends upon the configuration of the system and the particular aeration device.

Eckenfelder (8) has related the power input to degree of mixing for turbine aerators. He shows that 0.006 to 0.01 horsepower is required per 1000 gallons of basin capacity (hp/1000 gallons) in order to achieve uniform dissolved oxygen. However, for suspension of activated sludge which takes a minimum velocity of 0.4 to 0.5 feet per second, much higher power levels are required and distance from the aerator becomes a factor. At 14 feet, 0.02 to 0.03 hp/1000 gallons are required, while at 35 feet distance 0.05 to 0.06 hp/1000 gallons are required. These values show approximately a 10-fold increase in horsepower requirements if the objective at 35 feet from the aerator is sludge suspension rather than just uniform dissolved oxygen.

The aerators used in this project were the horizontally mounted brush aerator in the racetrack-shaped pilot Oxidation Ditch, and the vertically mounted turbine-type surface aerator in the square-shaped pilot Aerated Lagoon. See FIGURE 24 (page 95) for dimensions of the basin.

It was possible to vary basin depth and aerator blade submergence, thereby changing the power input to the basin contents. The resulting average power loadings for the individual test periods in the pilot Oxidation Ditch and Aerated Lagoon have been tabulated with other pertinent data in TABLE 21 (page 96). The BOD_5 actually removed per net horsepower input is also shown in this TABLE and should be of value in the design of such systems.

The values are seen to range from 2.3 to 5.3 pounds of BOD_5 removed per net horsepower hour if the Aerated Lagoon effluent is clarified. Lower values resulted if no clarification was provided at the actual test detention times.

The Oxidation Ditch with brush aeration removed from 1.5 to 5.0 pounds of BOD_5 per net horsepower when operated with clarification and sludge return. Lower values comparable to the first tests on the Aerated Lagoon resulted if no clarification was provided.

Support studies were conducted to obtain information on dissolved oxygen levels, temperature, velocity and sludge depth at various points in the two basins under different test conditions. The results of these studies are summarized below.

Dissolved Oxygen and Temperature in Pilot Lagoon

TABLE 22 (page 97) shows data from dissolved oxygen and temperature profiles in the pilot Aerated Lagoon. A total of eight studies were conducted using the different testing depths in an overall basin depth of 6.7 feet. Also included in the tabulated results of this TABLE are two tests performed at a depth of 2.0 feet when the total basin depth was 7.7 feet.

In general, it can be seen that the basin contents were kept nearly homogenous with respect to temperature and dissolved oxygen levels for all power loadings which ranged from less than 0.01 net hp/1000 gallons to greater than 0.02 net hp/1000 gallons.

The variance noticed most often is a 1.0-foot depth dissolved oxygen level that is 0.1 to 0.4 mg/l higher than the mid-depth value. The bottom dissolved oxygen level was never more than 0.3 mg/l less than the mid-depth value in these tests and frequently it equalled the mid-depth value. With only one exception, the effluent levels were within 0.2 mg/l of the 1.0-foot depth average level. The reproducibility of the dissolved oxygen probe in the field is no better than plus or minus 0.2 mg/l. Any correction for this variation could support the conclusion that the basin contents were kept nearly homogenous for the power levels tested.

Velocities and Sludge Buildup in Pilot Lagoon

TABLE 23 (page 98) contains a summary of the data on velocities and directions in the pilot Aerated Lagoon for two different general power loadings and two different basin depths. Directions of flow are shown for the highest power level input only since it is believed that the meter was not sensitive enough to accurately indicate directions when the velocity was far below 0.5 feet per second.

It is noted that for the power level above 0.01 net hp/1000 gallons, the velocity profile is fairly uniform at a given test point. The surface aerator is providing the same degree of agitation on the bottom of the basin as it is close to the surface. Test points 5 and 6 are close to the aerator as shown in the sketch and they have the highest velocities, as would be expected. Points 3 and 4 together, and points 7 and 8 together, consitute equidistant extremes at 13.5 feet from the surface aerator. For the highest power level test, the velocities ranged from 0.3 to 0.5 feet per second in a rather uniform fashion at this distance.

The situation changes as the power input drops below 0.01 net hp/1000 gallons. Although not so clearly defined in the last test in TABLE 23 as in the middle two tests, it can be seen that velocity definitely drops off with depth at this lower power input. Again, highest velocities occur closest to the aerator with minor exceptions.

Some sludge had collected on the basin bottom by this time and is so indicated in this TABLE.

Sludge buildup was recorded in separate testing during the project. A chronological listing of sludge depth is recorded in TABLE 24 (page 99) along with pertinent information on system operation.

The sludge depth was seen to increase much more when the lagoon depth was 7.7 feet and the power input was less than 0.01 net hp/1000 gallons than when the depth was 6.7 feet and the power input was higher. As TABLE 24 shows, the pilot Aerated Lagoon ended up with 8 to 12 inches of sludge on the bottom toward the end of the project (Test AL-13).

The sludge appeared to change position during Test AL-13 although the major deposits were at those points farthest from the aerator, as would be expected. The sludge sampled during Test AL-13 contained from 11 to 18 percent solids except under the aerator where it was very lean. The volatile content of the sludge solids ranged from 26 to 38 percent, thereby indicating some inorganic buildup within the aeration basin at lower power levels.

The information taken at the test points may not necessarily be indicative of sludge deposits in other locations of the pilot lagoon. In general, it can be concluded that sludge builds up at a greater rate as power input drops. Such a buildup is undesirable because it reduces the retention volume of the basin and may eventually have to be removed. The other objection involves the ultimate fate of the organic solids which get deposited. No information was developed during this project on the fate of such solids, but it would seem likely that the BOD of the solids would add to the BOD load of the basin, thereby requiring more oxygen in treatment with passage of time.

Dissolved Oxygen and Temperature in Pilot Ditch

TABLE 25 (page 100) contains a summary of the dissolved oxygen and temperature profiles found in the pilot Oxidation Ditch. Results from two different basin depths at about the same loading are tabulated. The trends observed here are different from those found in the pilot Aerated Lagoon. The reasons are twofold. First, the power input was above 0.01 net hp/1000 gallons for all tests. Second, the energy input to the basin contents from the brush aeration caused the total liquid volume to move around the racetrack-shaped basin.

Vertical mixing is claimed by the aerator manufacturer because the blades of the brush are gradually offset from one end to the other. The data tend to substantiate this claim on vertical mixing because in all tests the dissolved oxygen level was not found to decrease with depth. The temperature was found to be uniform throughout the basin contents in all tests.

Because of the "plug flow" beyond the aerator, a decrease in oxygen would be expected as biological activity proceeds and the liquid follows the path around and back to the aerator. Such a decrease, ranging from 0.2

to 0.5 mg/l is noted in all the data after the first test. It is concluded that the oxidation ditch operation was completely mixed with respect to temperature but was a short-term plug flow system as evidenced by the change in dissolved oxygen level along the length of the tank.

Velocities and Sludge Buildup in Pilot Ditch

TABLE 26 (page 101) contains a summary of the velocity measurements made in the pilot Oxidation Ditch for varying depths at power inputs above 0.01 net hp/1000 gallons.

When the oxidation ditch basin was at the 8.6-foot depth (Test OD-8 for results shown), the basin contents showed little motion below the first 5 feet, yet during the test series at a basin depth of 6.7 feet (Test OD-1), the basin contents were almost completely mixed with respect to velocity except for surface values closest to the aerator.

Comparing the two test series at depths less than 6.7 feet reveals nearly complete mixing except in the last 12 to 14 inches of basin depth. Here liquid motion was detected, but it was generally a trace to 0.1 feet per second.

In summary, it appears that the basin contents are kept in fairly uniform motion under the influence of the brush type aerator at the power levels studied when the depth is approximately 7 feet or less. Power inputs greater than approximately 0.010 to 0.015 hp/1000 gallons would definitely be necessary to keep the contents mixed as the basin depth is increased beyond the 7 foot level.

Concerning direction of flow, no separate tabulation of these measurements has been prepared because the directions at the higher velocities do not differ greatly from the expected direction around the racetrack-shaped basin. As stated earlier for the pilot Aerated Lagoon, no accurate value can be read for the very low velocities sometimes encountered. Sludge depth in the pilot Oxidation Ditch was studied with duration of operation, but the mechanical difficulties required occasional drainage of the system (see TABLE 40, page 130 in the APPENDIX). These interruptions left no valid longterm data to be analyzed. In general, sludge deposits on the bottom were sparse and never found to be more than two inches deep. Accumulations were observed at the tank ends when the basin was emptied. These accumulations were not more than several inches thick.

Summary of Findings on Aeration and Mixing

In general, the following can be concluded:

Dissolved oxygen and temperature can be maintained uniformly at lower power levels than required to keep solids suspended.

The aerated lagoon process will allow solids to be deposited on the basin bottom at power levels that in the oxidation ditch will keep the solids suspended.

The directional flow capabilities of the brush aerator are very desirable.

Special BOD Studies

Some work was completed during the project on the relationship between mixed, settled, and filtered 5-day BOD, COD to BOD_5 ratios, and long term BOD's of the pilot plant feed and the various system effluents. TABLE 27 (page 102) contains a summary of the BOD_5 and COD test results.

It is noted that a greater part of the pilot feed (PF) BOD_5 remained after filtering than did any of the system effluents. In the case of effluents from the pilot Aerated Lagoon (AL) and Oxidation Ditch (OD), the soluble BOD_5 values in May and October of 1969 ranged from 1 to 11 mg/l. The trickling filter effluents were higher in soluble BOD_5 except for the test results on Trickling Filter 2 (TF2) when the feed to the system came from the Oxidation Ditch.

The March to May, 1970 data in TABLE 27 show a changing COD to BOD_5 ratio through the treatment processes. The PF averaged 3.1:1 COD to BOD_5. This ratio was changed in TF2 to 4.1:1 and in AL to 11.9:1, meaning that BOD_5 was destroyed more completely than COD during treatment, as would be expected. The ratio was raised to approximately 9.6:1 when OD was fed from the filters. The ratio reached 11.2:1 when TF1 was fed from OD that was being fed from TF2.

The proportion of mixed to settled BOD_5 for TF2 operating on the black-liquor-dosed pilot feed which is symbolized PF(BL) was much higher than the same system when the PF had only bleach liquor added to it and first passed through TF1 (feeds of PF(2) and PF(3)). Compare 449 to 420 and 165 to 50. These results imply that little of the total BOD_5 was converted to settleable solids when the system was not being fed black liquor supplemented pilot feed.

Concerning long-term BOD results, a total of six tests were run during the project. Three samples of pilot feed or PF were tested and, during each of these tests, one system effluent was also tested. The jug technique which was used did not cross-check with the standard BOD_5. Therefore, the results are relative rather than absolute and should be treated accordingly. A summary of the results follows:

Date	Sample	Jug BOD (mg/l) 5-Day	Jug BOD (mg/l) 21-Day	BOD Ratio 21-Day/5-Day	First Order Temperature Coefficient
4-28-69	PF	142	293	2.1:1	0.095
	AL	57	128	2.2:1	0.054
5-19-69	PF	117	222	1.9:1	0.108
	TF1	57	133	2.3:1	0.045
8-20-69	PF	159	337	2.1:1	0.135
	TF1	80	205	2.6:1	0.074

First order curves were fitted to the BOD data but in most cases do not describe the data beyond about 10 days.

The pilot feed data in all three tests takes a second jump after 9 to 12 days and appears to be still rising after 21 days. The 21-day to 5-day BOD ratio remains close to 2:1 in all three tests.

The AL data and the first set of data for TF1 are fairly well fitted by a first order curve even out to 21 days where the curves level off. The TF2 data took a jump after 15 days and was only beginning to level off after 27 days.

The temperature coefficients for the first order portion of the long term BOD curves for pilot feed ranged from approximately 0.10 to 0.14/°C while the system effluents in the first two cases had temperature coefficients of about 0.05/°C.

The trickling filter data that could not be fitted beyond 15 days by a first order curve had a temperature coefficient of 0.074/°C. Ultimate BOD values cannot be taken from the first order portions of the curves which showed jumps. In any case, relative rather than absolute values were obtained and it was for this reason that additional long term BOD tests were not planned.

National Council (4) found an average ratio for COD to BOD_5 of 3.8:1 for raw filtered effluents from 8 different pulp and paper mills. With biological treatment, this average ratio was raised to 16.3:1. A lignin correction reduced the average raw effluent ratio to 2.2:1 and the treated ratio to 4.4:1. They concluded that rapid BOD estimation based on the COD test was not possible for kraft effluents because there were no fixed relationships even with the lignin correction.

Kraft Effluent Interference to Winkler Dissolved Oxygen Test

Dissolved oxygen determinations are very important both in monitoring the operation of biological treatment and in the measurement of biochemical oxygen demand. Such determinations can be made chemically by the standard Winkler test or polarographically by either the membrane electrode or the dropping mercury electrode. Past investigators who have studied the Winkler method versus the polarographic methods have found that the Winkler method can give appreciably lower dissolved oxygen concentrations in certain contaminated solutions.

McKeown (17) reported on comprehensive studies comparing Winkler results to membrane electrode results in solutions containing pulp and paper mill effluent and found the electrode measurement to be the better technique both in the laboratory and in the field. Based on these studies, The Mead Corporation has generally used the membrane electrode in field work involving measurements of dissolved oxygen in treatment basins, rivers and lakes. The membrane probe was used for all field measurements in the

present project. However, its use in the laboratory for the BOD test was limited generally to obtaining initial dissolved oxygen values of the effluent samples before dilution and incubation. The standard Winkler test was then run on the dilution water and, after 5 days, on the diluted samples.

The effect of pulp and paper effluents on the Winkler test when diluted 6 to 150 times in the BOD test was considered to be slight. Comparative tests during and after this project using a temperature compensated membrane probe (see PROCEDURES) showed this assumption to generally be correct if applied to the first 18 months of the project when the pilot feed was taken as it came from the mill primary clarifier or when mixed with bleach plant effluent. For these situations the membrane probe values were slightly higher on the average but no trends could be defined and there would be little effect in calculation of BOD's since a difference of readings is used.

Laboratory work did show that a correction is necessary for the Winkler determination of dissolved oxygen when the pilot feed was being supplemented with black liquor during the final phase of the project. Inhibition of the Winkler value was found to be a function of sample volume added to the BOD bottle and also a function of the method of treatment to some extent. Corrections were derived for application to Winkler values after incubation as follows:

$$\text{True D.O.} = \text{Winkler D.O.} + \Delta\text{D.O.}$$

where, for PF, TF1, and TF2:

$$\Delta\text{D.O.} = 0.131 \times \text{sample volume up to 10 ml,}$$

and

$$\Delta\text{D.O.} = 1.31 + 0.054 \times (\text{sample volume} - 10\ \text{ml}) \text{ for more;}$$

while, for AL:

$$\Delta\text{D.O.} = 0.097 \times \text{sample volume up to 10 ml,}$$

and

$$\Delta\text{D.O.} = 0.97 + 0.033 \times (\text{sample volume} - 10\ \text{ml}) \text{ for more;}$$

and for OD:

$$\Delta\text{D.O.} = 0.060 \times \text{sample volume up to 10 ml,}$$

and

$$\Delta\text{D.O.} = 0.60 + 0.019 \times (\text{sample volume} - 10\ \text{ml.}) \text{ for more.}$$

As can be seen, the correction is greater for the pilot feed and the trickling filters than for the aeration basin effluents. When the systems were run in combination, the system effluent was corrected the same as the unit it followed.

In conclusion, it is very desirable that future BOD work on this type of wastewater be conducted with the membrane electrode rather than the Winkler test since the Winkler can be reading low part of the time and consistent results may not be obtained.

Dye Studies on Pilot Systems

Several tracer dye studies were conducted on the pilot system at the termination of the field testing in May, 1970. Black liquor was still being added to the pilot feed at this time but its large consumption of dye made its presence very undesirable, so it was removed. Since the pilot feed was the only large volume source of water available at the site, it had to be used during the dye studies.

Because of long detention times in the two aeration basins, the black liquor content could not be flushed out in the available time. Response analyses of the impulse inputs are, therefore, not possible because of the uncertainty of remaining black liquor interference with and comsumption of the dye. Therefore, only the times to the occurrence of peak dye concentration in these basins will be reported here.

The pilot Oxidation Ditch was being operated at a depth of 4.3 feet and a theoretical detention time of 2 days. The power input during the dye tests was greater than 0.02 net hp/1000 gallons, for which earlier velocity work would indicate an average velocity in the basin of at least 0.4 feet per second. The main dye peak occurred at a corrected time of approximately 8 minutes. From this point, the dye concentration dropped rapidly to a new plateau at approximately 30 minutes and then dropped gradually after that. Another set of results showed a first peak at a corrected time of approximately 7 minutes followed by a greater peak at 29 minutes. A once-around flow time at an average velocity of 0.4 feet per second calculates out to 7.5 minutes. The favorable agreement of the first peak in both tests strongly indicates a plug flow condition in the pilot Oxidation Ditch. The second peaks must correspond to the second circuit of the dye-dosed plug of water, only now the dye is spreading and so the peak takes longer.

The pilot Aerated Lagoon was being operated at a depth of 7.7 feet and a theoretical detention time of 7.0 days. The power input during the dye tests was less than 0.01 net hp/1000 gallons, for which earlier velocity work would indicate an average velocity in the basin of less than 0.3 feet per second. A principal dye peak occurred at a corrected time of approximately 8 to 9.5 minutes depending upon the test. A second peak showed up after a lag and could be interpreted as a cycle time due to liquid motion caused by the aerator rotation, but by a second cycle the basin influent would become well mixed with the existing contents. The dye then tailed out over a period of many hours. Such results as were obtained do favor interpretation of a well mixed condition in the pilot Aerated Lagoon after the initial cycle.

Results from dye studies on the Trickling Filters were analyzed to find an "n" value to be used in the data modeling (7). The corrected peak dye times through both filters were normalized with respect to column height and a log-log slope was determined. The data were as follows:

Corrected Peak Time (minutes)	Sampling Depth (feet)	Hydraulic Loading (gpd/sf)	Normalized Time (Minutes per Foot of Depth)
1.36	24	3150	0.057
2.90	24	3000	0.121
0.30	16	6000	0.019 X
0.70	16	3150	0.044 X
0.70	16	3000	0.044 X
0.24	8	4300	0.031 X
0.32	8	3150	0.041 X
0.35	8	3000	0.044 X

The line of best fit for these results fairly well satisfies the values indicated with an "X" (see FIGURE 7, page 38). The "n" for this range of hydraulic loadings is therefore found to be 1.20. Such a value is much larger than others have reported for similar media (7); however, the hydraulic loadings are also quite large. It is concluded that "n" is not only a direct function of hydraulic loading but is also dependent upon absolute loading rate.

The two clarifiers were also dosed with dye during these tests. A peak in Clarifier 1 occurred 30 to 45 minutes after the dye was injected. The theoretical detention time under test flow conditions was 4.1 hours, thus indicating some short circuiting. Likewise in Clarifier 2, the dye peak occurred at 18 to 36 minutes when the theoretical detention time was 1.8 hours.

Aeration Basin Oxygen Uptake Rates

Oxygen uptake rates were determined during the last phase of the project when black liquor was being added to the pilot feed.

Initially only oxygen decay and temperature were recorded on the samples with time. After the procedure was developed, several sets of data were obtained for samples taken at varying depths at six points in the pilot Aerated Lagoon. The suspended solids and volatile suspended solids of the mixed liquor contents in the lagoon were also determined.

The initial data showed oxygen uptake rates in the pilot Oxidation Ditch of 3.8 to 6.7 mg/l/hour, in the Trickling Filter effluents of slightly greater than 1.0 mg/l/hour uptake, and approximately 2.8 mg/l/hour uptake in the pilot Aerated Lagoon. The more complete data taken in the pilot Aerated Lagoon are shown in TABLE 28 (page 103) from which several conclusions can be made as follows.

The Aerated Lagoon contents appear fairly well mixed in the areas and depths sampled, as indicated by the almost random location of the highest solids value in each test and also as indicated, especially in the case of volatile suspended solids, the close agreement of all values in each test with minor exception.

The oxygen uptake rate under similar test conditions on different days appears to vary by more than 2.0 mg/1/hour. A greater uptake is calculated from the first hour's data than if the test proceeds for more than 2 hours. The overall range of oxygen uptake rates in this test series is seen to be 2.4 to 4.9 mg/1/hour based on the first 60 minute values in each determination.

Sludge Volume Index

Biological content sludge from OD and TF1 was settled continuously in the two pilot Clarifiers and the sludge was recycled for the majority of the test periods. The suspended solids content of both sludges was found to be quite variable with extremes of 0.1 percent and 1.8 percent being encountered.

An indicator of sludge settleability is the sludge volume index (SVI) which relates the volume occupied by the settled sludge to the weight of the suspended solids in this sludge.

The average SVI's for all test periods in which such information was taken are shown in TABLE 29 (page 104) along with clarifier loading rates and detention times. It should be noted that the sludge volume index was always below 100. Settleability of these sludges was quite good.

Results of Nitrogen and Phosphorus Levels After Treatment

Throughout the project the Main Clarifier effluent (MC) was tested for existing nutrient content before setting the feed rate for addition of aqua ammonia and phosphoric acid. At the end of every 6 months or "Project Quarter" the rate was adjusted to compensate for existing levels and still maintain a proportion of 5 pounds of ammonia nitrogen and 1 pound of phosphate phosphorus for every 100 pounds of applied BOD_5 (i.e., 100:5:1 for BOD_5:N:P).

The mill clarified effluent with the additional nutrients added was then designated Pilot Feed or PF and was also tested for final nutrient content. TABLE 30 (page 105) shows the results of testing for total and soluble forms of nitrate nitrogen, total Kjeldahl nitrogen, ammonia nitrogen, and phosphate phosphorus on both MC and PF by Project Quarter. As can be noted in this TABLE, the most nutrients were added in the fourth Project Quarter, which was when the black liquor was being added to the MC for this project.

TABLES 31 and 32 (pages 106 and 107) contain a similar summary of the total and soluble nutrient forms still remaining in the TF1 and TF2 effluents after biological treatment. TABLE 33 (page 108) contains the results from the pilot Aerated Lagoon and TABLE 34 (page 109) contains pilot Oxidation Ditch results. Selected test conditions are included in all four TABLES for the reader's benefit.

The very significant finding of this work is that high residual nutrient levels still remained in the treated effluent when original dosages of 100:5:1 were provided. Future work should be directed toward the optimization of nutrient dosages so that a minimum cost for nutrients will be paid and a minimum residual nutrient level will be discharged.

Chemical and Power Costs for Pilot Plant Operation

The chemicals used during the project were aqua ammonia (26°Be), phosphoric acid (75 percent) and Hodag FD-62 defoamer (10 percent active). Ammonia as nitrogen (N) was sixteen cents per pound and the phosphoric acid as phosphorus (P) was forty-five cents per pound for the quantities used in this project.

TABLE 35 (page 110) shows that over the entire project the nitrogen cost an average of approximately one cent and the phosphorus about one-half cent for every pound of applied BOD_5. TABLES 36, 37, 38, and 39 (pages 111 through 114) show the actual pounds of N and P required for each pound of BOD_5 removed for each test on the four pilot units, respectively.

On TF1, the pounds of N ranged from 0.047 to 0.110 with an average of 0.079 pounds per pound BOD_5 removed. The pounds of P ranged from 0.008 to 0.022 with an average of 0.014.

The TF2 unit showed a wider range from 0.085 to 0.684 pounds N required with an average of 0.176 pounds N per pound of BOD_5 removed. The P ranged from 0.015 to 0.145 pounds with an average of 0.033 pounds.

On AL the range was 0.051 to 0.130 pounds of N per pound of BOD_5 removed with an average of 0.085 pounds. The P ranged from 0.008 to 0.026 with an average of 0.016 pounds required.

The OD required an average of 0.054 pounds N with a range of 0.036 to 0.079 pounds per pound removed BOD_5. An average of 0.009 pounds of P was required with a range from 0.006 to 0.016 pounds.

The average nutrient usage can be summarized as follows:

Unit	lbs usage/lb BOD_5 removed	
	Nitrogen	Phosphorus
TF1	0.079	0.014
TF2	0.176	0.033
AL	0.085	0.016
OD	0.079	0.009

It should be noted that TF1 with sludge recycle "consumed" only half the nutrients required for comparable operation in the conventional TF2 with filtrate recycle. Furthermore, nutrient usage rate in TF1 based on removed BOD_5 is similar to the rate required in AL. Of the four units on the average, OD consumed the least total nutrients, while TF2 consumed the most.

The relative usage rates would be economically important if, in optimization, the actual addition rates could be adjusted in the same proportion.

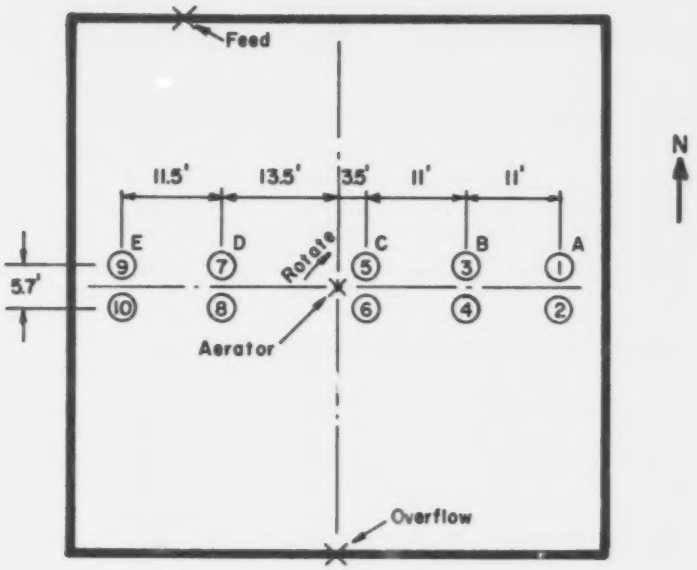
Using bulk prices of three cents per pound for N and fifteen cents per pound for P, the nitrogen cost was approximately 0.2 cents and the phosphorus 0.17 cents for each pound of applied BOD_5 over the entire project.

The defoamer was supplied at a cost of 52 cents per pound. Approximately 700 pounds were used during the project, resulting in a total cost of $364.00 for defoamer. The bulk of this addition occurred during the final four months when black liquor was being added to PF. (See the Operation Procedures in SECTION IX.)

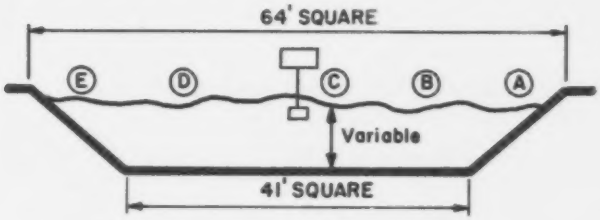
The power cost shown in TABLE 35 included the aerators, all pumps, sample timers and lights. The electricity used in the pilot plant per pound of applied BOD_5 ranged from 1.1 to 1.8 kilowatt hours (KWH).

At 1.5 cents per KWH, the electrical cost for this operation ranged from 1.7 cents to 2.7 cents per pound of applied BOD_5.

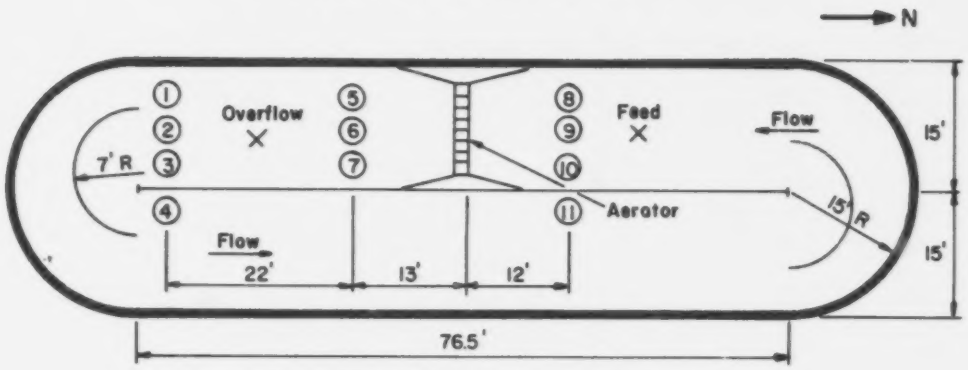
TEST POINT LOCATION IN PILOT AERATION BASINS
(Mead-FWQA Project on Biological Treatment)



Plan View Of Pilot Aerated Lagoon



Profile View Of Pilot Aerated Lagoon



Plan View Of Pilot Oxidation Ditch

FIGURE 24

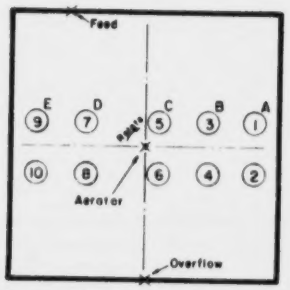
POWER LOADINGS AND BOD_5 REMOVALS IN AERATION BASINS
(Mead-FWQA Project on Biological Treatment)

Test I.D.	Volume (gallons)	Deten. Time (days)	Net hp	Net hp/1000 gal.	Pounds BOD_5 Removed per Net hp/hr
TURBINE AERATOR OPERATION WITH UNSETTLED EFFLUENT					
AL-1	133,400	2.3	1.74	0.013	1.8
AL-2	133,400	1.5	1.74	0.013	2.0
AL-3	133,400	3.0	1.74	0.013	0.7
AL-4	133.400	2.3	1.74	0.013	0.9
TURBINE AERATOR OPERATION WITH SETTLED EFFLUENT					
AL-5	133,400	3.8	0.94	0.007	2.3
AL-6	133.400	3.0	0.94	0.007	2.8
AL-7	133,400	2.3	0.94	0.007	3.4
AL-8	162,300	1.4	1.07	0.007	-
AL-9	100,500	1.7	0.40	0.004	-
AL-10	162,300	3.5	0.94	0.006	2.5
AL-11	100,500	1.7	0.64	0.006	5.3
AL-12	88,500	1.8	1.00	0.011	5.3
AL-13	162,300	7.0	0.95	0.006	4.4
BRUSH AERATOR OPERATION WITH UNSETTLED EFFLUENT					
OD-1	152,000	3.0	1.88	0.012	1.4
OD-2	157,500	2.0	2.68	0.017	1.1
BRUSH AERATOR WITH SETTLED EFFLUENT AND SLUDGE RETURN					
OD-3	157,500	1.0	2.01	0.013	5.0
OD-4	90,000	1.0	0.93	0.010	4.8
OD-5	90,000	2.0	0.93	0.010	2.9
OD-6	117,000	1.0	2.01	0.017	3.7
OD-7	117,000	2.0	2.14	0.018	1.8
OD-8	193,000	2.0	2.41	0.013	2.3
OD-9	96,000	2.0	2.09	0.022	4.0
OD-10	96,000	2.0	2.27	0.024	1.5

TABLE 21

DISSOLVED OXYGEN AND TEMPERATURE IN PILOT AERATED LAGOON
(Mead-FWQA Project on Biological Treatment)
Dissolved Oxygen in mg/l and Temperature in °C
TEST POINTS (See Sketch Below)

Location Depth	2	4	6	8	10	Effluent
POWER LEVEL GREATER THAN 0.02 NET HP/1000 GALLONS (Depth 6.7 ft.)						
1.0 ft.	-	3.0@30°	3.0@30°	3.0@30°	-	-
Middepth	-	3.0@30°	3.0@30°	3.0@30°	-	-
Bottom	-	2.8@30°	2.9@30°	2.9@30°	-	
1.0 ft.	-	1.6@31°	1.4@31°	1.5@31°	-	1.7@31°
Middepth	-	1.6@31°	1.4@31°	1.5@31°	-	
Bottom	-	1.6@31°	1.4@31°	1.4@31°	-	
1.0 ft.	-	1.4@32°	1.4@32°	1.4@32°	-	1.6@32°
Middepth	-	1.5@32°	1.4@32°	1.6@32°	-	
Bottom	-	1.6@32°	1.4@32°	1.7@32°	-	
POWER LEVEL GREATER THAN 0.01 NET HP/1000 GALLONS (Depth 6.7 ft.)						
1.0 ft.	7.0@22°	7.1@22°	7.2@22°	6.0@22°	6.5@23°	5.5@22°
Middepth	6.6@22°	6.8@22°	7.0@22°	6.7@22°	6.4@22°	
Bottom	6.5@22°	6.7@22°	6.9@22°	6.7@22°	6.4@22°	
1.0 ft.	4.6@26°	4.6@26°	4.6@26°	4.6@26°	4.4@26°	4.6@26°
Middepth	4.6@26°	4.6@26°	4.5@26°	4.6@26°	4.4@26°	
Bottom	4.6@26°	4.5@26°	4.5@26°	4.3@26°	4.3@26°	
1.0 ft.	3.6@28°	3.4@28°	3.5@28°	3.4@28°	3.6@28°	-
Middepth	3.6@28°	3.5@28°	3.5@28°	3.5@28°	3.6@28°	
Bottom	3.6@28°	3.6@28°	3.5@28°	3.4@28°	3.6@28°	
1.0 ft.	2.5@27°	2.5@27°	2.4@27°	2.4@27°	2.5@27°	2.5@27°
Middepth	2.5@27°	2.4@27°	2.4@27°	2.4@27°	2.5@27°	
Bottom	2.5@27°	2.4@27°	2.4@27°	2.4@27°	2.5@27°	
POWER LEVEL LESS THAN 0.01 NET HP/1000 GALLONS						
1.0 ft.	3.7@28°	3.4@28°	3.4@28°	3.4@28°	3.4@28°	3.6@28°
Middepth	3.6@28°	3.4@28°	3.4@28°	3.4@28°	3.4@28°	
6.7 ft.	3.6@28°	3.4@28°	3.6@28°	3.4@28°	3.4@28°	
2.0 ft.	-	0.2@20°	0.2@21°	0.2@20°	-	0.2@21°
Basin Depth is 7.7 ft.						
2.0 ft.	-	0.4@21°	0.4@21°	0.4@21°	-	-
Basin depth is 7.7 ft.						



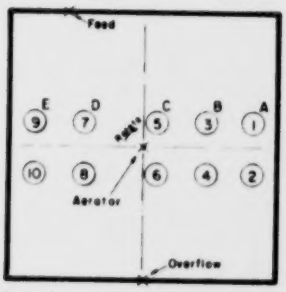
Plan View Of Pilot Aerated Lagoon

TABLE 22

VELOCITIES AND DIRECTIONS IN PILOT AERATED LAGOON
(Mead-FWQA Project on Biological Treatment)

Velocities in feet/second and Directions as Compass Point Toward
TEST POINTS (See Sketch Below)

Location Depth	3	4	5	6	7	8
POWER LEVEL GREATER THAN 0.01 NET HP/1000 GALLONS						
1.0 ft.	0.5E	0.6SE	0.5NE	0.5SSE	0.5NW	0.4W
2.0 ft.	0.3SSE	0.4S	0.6ESE	0.4SSW	0.3NNE	0.4N
3.0 ft.	0.3SSE	0.4SSW	0.6SE	0.5SSW	0.4NNE	0.4NNE
4.0 ft.	0.3S	0.3SW	0.6SE	0.5SSW	0.4NNE	0.4NNE
5.0 ft.	0.3S	0.3SSW	0.7SSE	0.5SSW	0.4NNE	0.4N
6.0 ft.	0.4S	0.3SSW	0.6SSE	0.5S	0.5NNE	0.4N
6.7 ft.	0.4-	0.3-	0.5-	0.4-	0.4-	0.4-
POWER LEVEL LESS THAN 0.01 NET HP/1000 GALLONS						
1.0 ft.	0.5	0.3	0.5	0.6	0.6	0.5
2.0 ft.	0.5	0.3	0.4	0.5	0.4	0.4
3.0 ft.	0.4	0.3	0.3	0.3	0.3	0.3
4.0 ft.	0.2	0.2	0.2	0.2	0.3	0.2
5.0 ft.	0.2	0.2	0.1	0.1	0.2	0.1
6.0 ft.	0.1	0.1	0.1	trace	0.1	0.1
6.7 ft.	trace	trace	sludge	sludge	trace	trace
1.0 ft.	0.2	0.2	0.5	0.6	0.6	0.2
2.0 ft.	0.3	0.3	0.5	0.6	0.6	0.3
3.0 ft.	0.3	0.2	trace	0.2	0.1	0.4
4.0 ft.	0.1	0.1	trace	0.1	0.1	0.1
5.0 ft.	0	trace	trace	trace	trace	trace
6.0 ft.	0	trace	trace	trace	trace	trace
7.0 ft.	0	trace	trace	0	trace	trace
7.7 ft.	sludge	sludge	0	0	sludge	sludge
1.0 ft.	0.3	0.3	0.5	0.3	0.2	0.4
2.0 ft.	0.3	0.3	0.5	0.3	0.3	0.3
3.0 ft.	0.3	0.3	0.3	0.3	0.2	0.3
4.0 ft.	0.2	0.3	0.4	0.4	0.2	0.4
5.0 ft.	0.2	0.3	0.4	0.4	0.2	0.3
6.0 ft.	0.3	0.2	0.5	0.3	0.1	0.3
7.7 ft.	0	trace	0.5	0.3	0.1	0.1

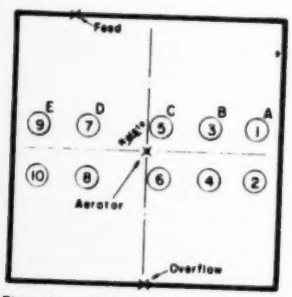


Plan View Of Pilot Aerated Lagoon

TABLE 23

HISTORY OF SLUDGE BUILDUP IN PILOT AERATED LAGOON
(Mead-FWQA Project on Biological Treatment)

Situation	TEST POINTS (See Sketch Below) 3	4	5	6	7	8	Average
Lagoon Filled (6-6-68)							
POWER LEVEL GREATER THAN 0.01 NET HP/1000 GALLONS							
Test AL-2 (8-28-68)							
Basin Depth 6.7 ft.							
Sludge Depth (inches)	0-1	0-1	0-1	0-1	0-1	0-1	<1 in.
Test AL-4 (11-5-68)							
Basin Depth 6.7 ft.							
Sludge Depth (inches)	trace	0	0	0	2	0	0.3 in.
POWER LEVEL LESS THAN 0.01 NET HP/1000 GALLONS							
Test AL-7 (5-6-69)							
Basin Depth 6.7 ft.							
Sludge Depth (inches)	3	3	0	0	8	5	3.2 in.
Test AL-10 (9-30-69)							
Basin Depth 7.7 ft.							
Sludge Depth (inches)	6	3	0	0	3	3	2.5 in.
Lagoon Emptied (10-11-69)							
Lagoon Filled (10-14-69)							
Test AL-13 (3-24-70)							
Basin Depth 7.7 ft.							
Sludge Depth (inches)	15	18	3	4	19	16	12.5 in.
Sludge Solids (%)	12.2	11.0	0.0	0.0	18.0	14.3	
Volatile Content	31%	29%	-	-	26%	31%	
Test AL-13 (4-28-70)							
Basin Depth 7.7 ft.							
Sludge Depth (inches)	16	12	1	1	10	9	8.2 in.
Sludge Solids (%)	11.1	12.9	8.7	8.7	10.7	12.7	
Volatile Content	31%	30%	38%	36%	29%	33%	



Plan View Of Pilot Aerated Lagoon

TABLE 24

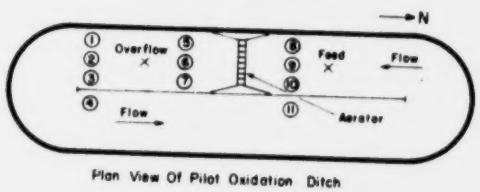
DISSOLVED OXYGEN AND TEMPERATURE IN PILOT DITCH
(Mead-FWQA Project on Biological Treatment)

Dissolved Oxygen in mg/l and Temperature in °C

TEST POINTS (See Sketch Below)

Location / Depth	1	3	8	10
1.0 ft.	4.7@29°	4.4@29°	5.1@29°	5.0@29°
2.0 ft.	4.2@29°	4.4@29°	5.0@29°	5.0@29°
3.0 ft.	4.3@29°	4.5@29°	5.0@29°	4.9@29°
Basin Depth is 6.7 ft.				
1.0 ft.	3.2@30°	3.2@30°	2.9@30°	2.9@30°
Middepth	3.2@30°	3.2@30°	2.9@30°	2.9@30°
Bottom	3.0@30°	3.0@30°	2.9@30°	2.9@30°
Basin Depth is 6.7 ft.				
1.0 ft.	2.5@32°	2.5@32°	2.0@32°	2.0@32°
Middepth	2.5@32°	2.5@32°	2.0@32°	2.0@32°
Bottom	2.4@32°	2.4@32°	2.0@32°	2.0@32°
Basin Depth is 6.7 ft.				
1.0 ft.	0.4@30°	0.6@30°	0.1@30°	0.2@30°
Middepth	0.3@30°	0.5@30°	0.1@30°	0.1@30°
Bottom	0.5@30°	0.6@30°	0.1@30°	0.1@30°
Basin Depth is 6.7 ft.				
1.0 ft.	1.7@32°	1.8@32°	1.5@32°	1.6@32°
Middepth	1.6@32°	1.8@32°	1.5@32°	1.5@32°
Bottom	1.6@32°	1.8@32°	1.4@32°	1.5@32°
Basin Depth is 7.0 ft.				
1.0 ft.	1.2@32°	1.3@32°	0.9@32°	0.9@32°
Middepth	1.1@32°	1.2@32°	0.9@32°	0.9@32°
Bottom	1.0@32°	1.2@32°	1.0@32°	1.0@32°
Basin Depth is 7.0 ft.				

POWER LEVEL IN ALL TESTS WAS APPROXIMATELY 0.015 NET HP/1000 GALLONS



Plan View Of Pilot Oxidation Ditch

TABLE 25

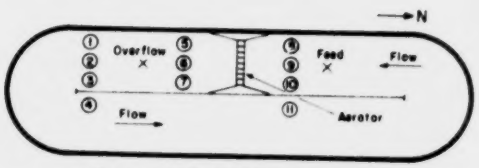
VELOCITIES IN PILOT OXIDATION DITCH
(Mead-FWQA Project on Biological Treatment)

Velocities in feet/second

TEST POINTS (See Sketch Below)

Location Depth	1	2	3	4	5	6	7	8	9	10	11
POWER LEVEL SLIGHTLY GREATER THAN 0.01 NET HP/1000 GALLONS											
1.0 ft.	1.2	1.2	1.1	0.3	1.3	1.1	0.5	0.5	0.5	tr	tr
2.0 ft.	1.2	1.1	0.1	tr	1.0	0.1	0.1	0.4	0.3	tr	tr
3.0 ft.	0.1	1.0	tr	tr	tr	tr	0.1	0.5	0.1	tr	tr
4.0 ft.	0.1	tr	tr	tr	tr	tr	tr	0.6	tr	tr	0
5.0 ft.	0.5	0.4	0.1	0.1	tr	0.1	0.1	0.5	0	0	0
6.0 ft.	0	0	0	0	0	0	0	0.4	0	0	0
7.0 ft.	0	0	0	0	0	0	0	0.3	0	0	0
8.0 ft.	0	0	0	0	0	0	0	0.2	0	0	0
Basin Depth is 8.6 ft.											
1.0 ft.	1.9	1.4	0.7	0.3	1.1	1.3	0.6	0.4	0.4	0.6	0.6
2.0 ft.	0.9	0.9	0.6	0.3	0.5	0.5	0.2	0.4	0.5	0.6	0.5
3.0 ft.	0.5	0.5	0.3	0.3	0.5	0.5	0.1	0.5	0.5	0.6	0.5
4.0 ft.	0.3	0.3	0.3	0.2	0.6	0.4	0.1	0.4	0.5	0.6	0.4
5.0 ft.	0.3	0.2	0.3	0.3	0.6	0.4	0.2	0.4	0.5	0.6	0.5
6.0 ft.	0.3	0.3	0.3	0.4	0.6	0.2	0.2	0.4	0.5	0.6	0.5
6.7 ft.	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.4	0.4	0.6	0.3
Basin Depth is 6.7 feet											
1.0 ft.	1.5	1.5	0.7	0.6	1.6	1.5	0.4	0.9	0.7	0.5	0.8
2.0 ft.	1.5	0.9	0.6	0.6	1.3	0.8	0.3	0.9	0.5	0.7	0.8
3.0 ft.	1.0	0.9	0.6	0.4	0.7	0.2	0.4	0.5	0.3	0.6	0.1
4.0 ft.	tr	tr	tr	tr	0.1	tr	tr	0.1	tr	tr	tr
5.0 ft.	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr
Basin Depth is 5.2 ft.											
1.0 ft.	1.1	1.2	0.6	0.7	1.3	1.3	0.8	0.7	0.6	0.4	0.5
2.0 ft.	0.9	0.8	0.5	0.6	1.1	0.9	0.4	0.7	0.5	0.4	0.4
3.0 ft.	0.7	0.5	0.4	0.4	1.0	0.5	0.3	0.7	0.5	0.3	0.2
4.0 ft.	sludge	0.2	0.1	0.1	0.3	0.2	0.1	sludge	0.2	0.2	sludge
Basin Depth is 4.0 ft.											

tr = trace



Plan View Of Pilot Oxidation Ditch

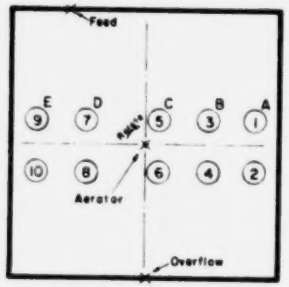
TABLE 26

SUMMARY OF AVERAGE BOD_5 FRACTIONS AND COD RATIOS
(Mead-FWQA Project on Biological Treatment)

System	Influent Organic Source	Test	Influent Organics(mg/l) Mixed	Settled	Filtered	Effluent Organics(mg/l) Mixed	Settled	Filtered
DATA FROM MAY, 1969 WHEN PILOT FEED WAS PF(2)								
TF1	PF	BOD_5	-	198	140	-	80	24
TF2	TF1	BOD_5	-	80	24	165	50	18
AL	PF	BOD_5	-	198	140	86	32	4
OD	PF	BOD_5	-	198	140	-	30	11
DATA FROM OCTOBER, 1969 WHEN PILOT FEED WAS PF(3)								
TF1	PF	BOD_5	-	174	126	-	48	15
TF2	OD	BOD_5	-	22	9	30	21	8
AL	PF	BOD_5	-	174	126	88	22	1
OD	PF	BOD_5	-	174	126	-	22	9
DATA OF MARCH-MAY, 1970 WHEN PILOT FEED WAS PF(BL)								
TF1	OD	BOD_5	-	74	-	-	59	-
		COD	-	718	-	-	661	-
		Ratio		9.7:1			11.2:1	
TF1	TF2	BOD_5	392	370	-	-	277	210*
		COD	-	1613	-	-	1599	996*
		Ratio		4.4:1			5.8:1	4.7:1
TF2	PF	BOD_5	-	626	-	449	420	*
		COD	-	1927	-	-	1718	*
		Ratio		3.1:1			4.1:1	6.1:1
AL	TF2	BOD_5	515	503	-	111	101	-
		COD	-	1893	-	-	831	-
		Ratio		3.8:1			8.2:1	
AL	PF	BOD_5	-	626	-	-	91	-
		COD	-	1927	-	-	1088	-
		Ratio		3.1:1			11.9:1	
OD	TF2	BOD_5	515	503	-	-	74	-
		COD	-	1893	-	-	718	-
		Ratio		3.8:1			9.7:1	
OD	TF1	BOD_5	-	277	-	-	95	-
		COD	-	1599	-	-	902	-
		Ratio		5.8:1			9.5:1	

*Different sampling dates from other values in averages.

TABLE 27



Plan View Of Pilot Aerated Lagoon

TABLE 28

OXYGEN UPTAKE DETERMINATIONS IN PILOT AERATED LAGOON
(Mead-FWQA Project on Biological Treatment)

TEST POINTS (see Sketch)	3	4	5	6	7	8
DEPTH	1 foot	6 feet	2 feet	5 feet	3 feet	4 feet
May 17, 1970 SAMPLES OF CONTENTS						
Suspended Solids (mg/l)	496	460	516*	488	396	456
Volatile Susp. Solids (mg/l)	342	354	335	351	356	456*
Average Test Temp. (°C)	24.4	24.7	24.3	24.1	24.1	24.1
O_2 Uptake Rate (mg/l/hr.)						
First 60 min. of test	4.2	4.7	4.9*	4.4	4.5	4.4
105 min. of test	3.8	4.0	4.2*	3.8	3.7	3.8
May 21, 1970 SAMPLES OF CONTENTS						
Suspended Solids (mg/l)	620*	600	588	460	600	588
Volatile Susp. Solids (mg/l)	487*	444	411	300	416	440
Average Test Temp. (°C)	24.7	24.5	25.6	24.5	24.8	24.5
O_2 Uptake Rate (mg/l/hr.)						
First 60 min. of test	3.3	3.2	3.5*	3.3	3.2	3.1
135 min. of test	2.8	2.9	3.2*	2.9	2.9	2.9
May 28, 1970 SAMPLES OF CONTENTS						
Suspended Solids (mg/l)	672*	588	620	652	580	632
Volatile Susp. Solids (mg/l)	551*	507	540	525	532	528
Average Test Temp. (°C)	22.8	22.8	22.8	22.6	22.9	22.9
O_2 Uptake Rate (mg/l/hr.)						
First 60 min. of test	2.7	2.6	2.7	2.5	2.8*	2.6
135 min. of test	2.5*	2.4	2.5*	2.2	2.4	2.4
May 29, 1970 SAMPLES OF CONTENTS						
Suspended Solids (mg/l)	720*	688	700*	720	708	656
Volatile Susp. Solids (mg/l)	446	447	463	467	445	472*
Average Test Temp. (°C)	23.8	24.0	24.0	23.9	23.9	23.9
O_2 Uptake Rate (mg/l/hr.)						
First 60 min. of test	2.5	2.5	2.6*	2.4	2.6*	2.5
135 min. of test	2.3	2.5	2.5	2.4	2.6*	2.4

* indicates highest value of stated parameter in given test.

SUMMARY OF SLUDGE VOLUME INDEX ON PILOT CLARIFIERS
(Mead-FWQA Project on Biological Treatment)

Test I.D.	Feed (gpm)	Clarifier Upflow (gpd/sf)	Deten. Time (hours)	Sludge Solids Settleable (ml/l/½hr.)	Sludge Solids Suspended (mg/l)	SVI
CLARIFIER 1 WITH SLUDGE RECYCLE TO TRICKLING FILTER 1						
TF1-8	33.3	588	1.8	375	8896	42
TF1-9	44.4	784	1.4	400	14055	29
TF1-10	29.6	522	2.1	79	2890	27
TF1-11	22.2	392	2.7	155	7956	19
TF1-12	33.3	588	1.8	540	15670	35
TF1-13	22.2	392	2.7	850	18071	47
TF1-14	22.2	392	2.7	37	991	37
TF1-15	14.8	260	4.1	915	16190	57
TF1-18	33.3	588	1.8	30	7567	4
CLARIFIER 2 WITH SLUDGE RECYCLE TO OXIDATION DITCH						
OD-4	62.5	950	2.2	23	1227	19
OD-5	31.2	494	4.4	272	4984	54
OD-6	81.0	1230	1.7	520	5491	95
OD-7	40.5	614	3.4	580	9474	61
OD-8	66.7	1010	2.0	785	7897	99
OD-9	33.3	507	4.1	20	932	22
OD-10	33.3	507	4.1	72	2162	33

TABLE 29

SUMMARY OF NUTRIENT TEST RESULTS ON MILL CLARIFIER AND PILOT FEED
(Mead-FWQA Project on Biological Treatment)

Project Quarter	NO_3-N (mg/l)	Kjeld-N (mg/l)	Kjeld-N (% Soluble)	NH_3-N (mg/l)	NH_3-N (% Soluble)	PO_4-P (mg/l)	PO_4-P (% Soluble)
MILL CLARIFIED EFFLUENT BEFORE NUTRIENT ADDITION							
1	0.3	5.9	44	1.0	70	0.7	14
2	0.5	4.6	33	0.9	78	0.6	50
3	0.3	4.7	43	0.5	60	0.4	50
4	0.8	6.0	63	1.5	80	1.3	85
PILOT FEED (MILL CLARIFIED EFFLUENT WITH NUTRIENTS ADDED)							
1	0.3	13.9	76	7.2	88	1.7	59
2	-	16.8	-	9.8	-	3.3	79
3	-	22.5	-	10.9	-	2.8	82
4(BL)	-	40.0	-	24.1	-	8.4	92

TABLE 30

TABLE 31

TOTAL AND SOLUBLE NUTRIENT TEST RESULTS ON TRICKLING FILTER 1
(Mead-FWQA Project on Biological Treatment)

Test I.D.	Test Conditions: Recycle To Feed Ratio	Test Conditions: Hydraulic Loading (gpd/sf)	Nutrient Results: NO_3-N (mg/l)	Kjeld-N (mg/l)	Kjeld-N (% Soluble)	NH_3-N (mg/l)	NH_3-N (% Soluble)	PO_4-P (mg/l)	PO_4-P (% Soluble)
TF1-1	1:1	4000	-	7.9	43	2.1	57	0.6	-
TF1-2	1:1	6000	-	18.1	-	5.1	-	1.4	-
TF1-3	1:1	8000	-	9.5	10	2.8	18	2.0	80
TF1-4	1:1	2000	-	9.8	61	3.9	59	1.6	50
TF1-5	1:1	4000	0.4	13.6	67	5.0	-	1.5	40
TF1-6	0:1	2660	0.5	15.4	69	6.3	99	1.5	74
TF1-7	0:1	1330	0.4	-	-	5.8	86	1.2	59
TF1-8	1:1	6000	-	8.7	62	2.1	76	1.5	60
TF1-9	0.5:1	6000	0.7	12.4	52	3.4	91	1.6	56
TF1-10	0.5:1	4000	0.5	15.9	33	4.9	78	2.6	69
TF1-11	1:1	4000	0.4	15.7	67	9.1	96	1.6	88
TF1-12	1:1	6000	-	10.4	49	3.7	81	3.2	78
TF1-13*	1:1	4000	-	23.1	77	14.9	97	4.1	86
TF1-14	1:1	4000	0.4	17.9	59	7.1	93	5.1	81
TF1-15	5:1	8000	0.3	10.2	39	1.9	90	1.3	85
TF1-16	0:1	6000	0.4	17.1	75	7.8	100	2.2	82
TF1-17*	0:1	3000	0.3	32.9	59	12.2	97	6.4	86
TF1-18*	1:1	6000	0.6	29.1	66	9.1	92	5.4	83

* Designates special feed source.

TOTAL AND SOLUBLE NUTRIENT TEST RESULTS ON TRICKLING FILTER 2
(Mead-FWQA Project on Biological Treatment)

Test I.D.	Test Conditions: Recycle To Feed Ratio	Test Conditions: Hydraulic Loading (gpd/sf)	Nutrient Results: NO_3-N (mg/l)	Kjeld-N (mg/l)	Kjeld-N (% Soluble)	NH_3-N (mg/l)	NH_3-N (% Soluble)	PO_4-P (mg/l)	PO_4-P (% Soluble)
TF2-1	1:1	4000	-	7.8	60	1.9	-	0.8	50
TF2-2	0:1	2000	-	19.4	39	4.9	70	1.8	44
TF2-3	0:1	4000	-	9.9	59	2.6	54	2.0	10
TF2-4	1:1	4000	-	13.4	51	3.4	83	1.8	28
TF2-5	2:1	4000	0.3	15.7	31	3.6	33	2.0	20
TF2-6	2:1	4000	0.4	14.3	48	6.8	93	1.8	28
TF2-7	1:1	4000	0.5	-	-	6.6	-	1.9	32
TF2-8	1:1	6000	-	12.3	36	2.7	74	1.7	94
TF2-9	0.5:1	6000	0.6	14.1	64	4.1	81	1.9	84
TF2-10	0.5:1	4000	0.4	13.6	54	5.2	87	2.3	44
TF2-11*	1:1	4000	0.3	11.4	45	4.0	85	1.7	88
TF2-12	1:1	6000	-	16.0	47	5.8	88	3.1	58
TF2-13	1:1	4000	-	24.3	69	14.2	92	3.4	94
TF2-14*	1:1	4000	0.4	12.3	42	3.2	94	3.8	84
TF2-15*	0:1	6000	0.9	5.1	63	0.7	86	0.8	50
TF2-16	0:1	6000	0.3	35.4	72	12.4	93	3.7	79
TF2-17*	0:1	6000	0.6	43.0	90	24.3	95	6.7	91
TF2-18*	1:1	6000	0.7	34.7	84	18.5	96	7.3	92

* Designates special feed source.

TABLE 32

TABLE 33

TOTAL AND SOLUBLE NUTRIENT TEST RESULTS ON AERATED LAGOON
(Mead-FWQA Project on Biological Treatment)

Test I.D.	Test Conditions: Deten. Time (days)	Test Conditions: Organic Loading (ppd/1000cf)	Nutrient Results: NO_3-N (mg/l)	Kjeld-N (mg/l)	Kjeld-N (% Soluble)	NH_3-N (mg/l)	NH_3-N (% Soluble)	PO_4-P (mg/l)	PO_4-P (% Soluble)
AL-1	2.3	5.0	-	10.5	59	1.3	100	1.1	27
AL-2	1.5	7.3	-	17.3	24	1.3	100	1.7	6
AL-3	3.0	3.6	1.2	13.3	30	1.4	57	2.4	25
AL-4	2.3	5.3	1.3	15.4	34	1.7	71	1.7	41
AL-5	3.8	3.6	1.3	14.5	58	5.7	88	1.2	75
AL-6	3.0	3.8	1.2	15.3	48	4.5	91	2.3	78
AL-7	2.3	5.0	0.7	20.7	43	6.6	100	2.4	83
AL-8*	1.4	1.1	-	7.6	38	1.5	73	2.3	87
AL-9*	1.7	0.4	0.6	10.8	76	5.0	94	2.2	96
AL-10	3.5	2.3	0.9	10.6	42	0.9	100	1.8	72
AL-11*	1.7	6.2	0.7	17.0	65	4.8	92	2.3	74
AL-12*	1.8	12.1	0.4	26.3	46	7.4	97	4.6	91
AL-13*	7.0	3.4	0.4	49.0	68	25.1	97	7.1	78

*Designates special feed source.

TOTAL AND SOLUBLE NUTRIENT TEST RESULTS ON OXIDATION DITCH
(Mead-FWQA Project on Biological Treatment)

Test I.D.	Test Conditions: Deten. Time (days)	Test Conditions: Organic Loading (ppd/1000cf)	Nutrient Results: NO_3-N (mg/l)	Kjeld-N (mg/l)	Kjeld-N (% Soluble)	NH_3-N (mg/l)	NH_3-N (% Soluble)	PO_4-P (mg/l)	PO_4-P (% Soluble)
OXIDATION DITCH WITHOUT CLARIFICATION									
OD-1	3	4.4	-	10.0	-	1.8	-	1.1	-
OD-2	2	6.2	-	11.4	37	2.0	100	2.6	-
OXIDATION DITCH WITH CLARIFICATION									
OD-3	1	12.7	1.2	5.0	-	0.7	100	0.7	71
OD-4	1	15.4	1.2	15.3	43	3.5	60	1.4	43
OD-5	2	6.5	0.9	14.4	71	8.5	94	2.0	90
OD-6	1	12.4	-	4.6	50	1.8	72	2.4	94
OD-7	2	6.2	0.6	4.4	64	0.3	67	2.4	50
OD-8	2	6.0	0.5	6.8	81	1.8	100	0.7	72
OD-9*	2	13.3	0.7	20.0	40	3.9	87	6.0	79
OD-10*	2	8.5	1.3	17.8	41	3.0	87	6.8	90

*Designates special feed scurce.

TABLE 34.

TABLE 35

SUMMARY OF CHEMICAL AND POWER COSTS FOR TOTAL PILOT PLANT OPERATION
(Mead-FWQA Project on Biological Treatment)

Project Quarter	PILOT FEED Avg. Flow MGD	PILOT FEED Avg. BOD_5 mg/l	PILOT FEED Avg. BOD_5 lb/Day	NITROGEN* Avg. lbs. N/Day	NITROGEN* Cost/lb. Applied BOD_5	PHOSPHORUS* Avg. lbs. P/Day	PHOSPHORUS* Cost/lb. Applied BOD_5	ELECTRICAL USAGE Applied BOD_5 KWH/lb	ELECTRICAL USAGE Applied BOD_5 Cost/lb
1	0.232	202	384	17.1	$ 0.010	3.4	$ 0.005	1.10	$ 0.017
2	0.219	221	398	15.3	$ 0.008	2.3	$ 0.007	1.34	$ 0.020
3	0.175	236	354	12.0	$ 0.013	2.0	$ 0.006	1.30	$ 0.020
4	0.084	515	361	19.0	$ 0.013	3.8	$ 0.007	1.77	$ 0.027

* Desired ratio was 100:5:1, BOD:N:P. Addition was adjusted during 2nd and 3rd Quarters to allow for existing nutrient concentration in the pilot feed wastewater.

1st Quarter: Added 9.0 mg/l of NH_3-N and 1.8 mg/l of P = 100:4.5:0.9 True Ratio
2nd Quarter: Added 8.5 mg/l of NH_3-N and 1.3 mg/l of P = 100:3.9:0.6 True Ratio
3rd Quarter: Added 8.0 mg/l of NH_3-N and 1.3 mg/l of P = 100:3.4:0.6 True Ratio
4th Quarter: Added 27.0 mg/l of NH_3-N and 5.4 mg/l of P = 100:5.2:1.1 True Ratio

Electrical costs based on $0.015 per kilowatt hour
Chemical costs based on actual supply for project as follows: NH_3-N was $0.16 per pound; PO_4 was $0.45 per pound.
Full scale chemical costs should be lower in bulk quantities.

SUMMARY OF CHEMICAL USAGE ON TRICKLING FILTER WITH SLUDGE RECYCLE
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS					EDITED TEST RESULTS			
	Recycle to Feed Ratio	Hydraulic Loading (gpd/sf)	Height (feet)	System Feed	Organic Loading (ppd/1000 cf)	Lb.N/Lb. Applied BOD_5	Lb.P/Lb. Applied BOD_5	Lb.N/Lb. Removed BOD_5	Lb.P/Lb. Removed BOD_5
TRICKLING FILTER TESTS WITH SLUDGE RECYCLE									
TF1-7	0:1	1330	22	PF(2)	90	0.045	0.009	0.087	0.018
TF1-6	0:1	2660	22	PF(1)	180	0.045	0.009	0.094	0.019
TF1-17	0:1	3000	24	OD(BL)	90	-	-	-	-
TF1-10	0.5:1	4000	24	PF(2)	190	0.039	0.006	0.105	0.016
TF1-9	0.5:1	6000	24	PF(2)	300	0.039	0.006	0.082	0.013
TF1-4	1:1	2000	24	PF(1)	70	0.045	0.009	0.057	0.011
TF1-1	1:1	4000	24	PF(1)	140	0.045	0.009	0.067	0.013
TF1-5	1:1	4000	24	PF(1)	125	0.045	0.009	0.075	0.015
TF1-11	1:1	4000	24	PF(2)	140	0.039	0.006	0.057	0.009
TF1-14	1:1	4000	24	PF(3)	140	0.034	0.006	0.067	0.012
TF1-13	1:1	4000	24	TF2(3)	110	-	-	-	-
TF1-2	1:1	6000	24	PF(1)	230	0.045	0.009	0.097	0.019
TF1-8	1:1	6000	24	PF(2)	280	0.039	0.006	0.081	0.012
TF1-12	1:1	6000	24	PF(2)	200	0.039	0.006	0.082	0.013
TF1-18	1:1	6000	24	TF2(BL)	420	-	-	-	-
TF1-3	1:1	8000	24	PF(1)	250	0.045	0.009	0.110	0.022
TF1-15	5:1	8000	24	PF(3)	90	0.034	0.006	0.047	0.008

TABLE 36

TABLE 37

SUMMARY OF CHEMICAL USAGE ON TRICKLING FILTER WITH FILTRATE RECYCLE
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS					EDITED TEST RESULTS			
	Recycle to Feed Ratio	Hydraulic Loading (gpd/sf)	Height (feet)	System Feed	Organic Loading (ppd/1000 cf)	Lb.N/Lb. Applied BOD_5	Lb.P/Lb. Applied BOD_5	Lb.N/Lb. Removed BOD_5	Lb.P/Lb. Removed BOD_5
TRICKLING FILTER TESTS WITH FILTRATE RECYCLE									
TF2-2	0:1	2000	24	PF(1)	150	0.045	0.009	0.180	0.036
TF2-3	0:1	4000	24	PF(1)	250	0.045	0.009	0.170	0.035
TF1-16	0:1	6000	24	PF(3)	590	0.034	0.006	0.110	0.019
TF2-16	0:1	6000	24	PF(3)	590	0.034	0.006	0.211	0.037
TF2-17	0:1	6000	24	PF(BL)	1070	0.052	0.011	0.684	0.145
TF2-15	0:1	6000	24	OD(3)	40	-	-	-	-
TF2-10	0.5:1	4000	24	PF(2)	190	0.039	0.006	0.125	0.019
TF2-9	0.5:1	6000	24	PF(2)	300	0.039	0.006	0.221	0.034
TF2-4	1:1	4000	16	PF(1)	270	0.045	0.009	0.112	0.022
TF2-1	1:1	4000	24	PF(1)	140	0.045	0.009	0.085	0.017
TF2-7	1:1	4000	24	PF(2)	125	0.045	0.009	0.155	0.031
TF2-13	1:1	4000	24	PF(3)	160	0.039	0.006	0.133	0.020
TF2-11	1:1	4000	24	TF1(2)	55	-	-	-	-
TF2-14	1:1	4000	24	TF1(3)	70	-	-	-	-
TF2-8	1:1	6000	24	PF(2)	280	0.039	0.006	0.099	0.015
TF2-12	1:1	6000	24	PF(2)	195	0.039	0.006	0.124	0.019
TF2-18	1:1	6000	24	PF(BL)	620	0.052	0.011	0.152	0.032
TF2-5	2:1	4000	16	PF(1)	125	0.045	0.009	0.109	0.022
TF2-6	2:1	4000	24	PF(1)	80	0.045	0.009	0.138	0.028

SUMMARY OF AERATED LAGOON CHEMICAL USAGE RESULTS
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS					EDITED TEST RESULTS			
	Deten. Time (days)	Depth (feet)	System Feed	Organic Loading (ppd/1000cf)	(F/M Ratio)	Lb.N/Lb. Applied BOD_5	Lb.P/Lb. Applied BOD_5	Lb.N/Lb. Removed BOD_5	Lb.P/Lb. Removed BOD_5
AL-8	1.4	7.7	OD(2-3)	1.1	0.15	-	-	-	-
AL-2	1.5	6.7	PF(1)	7.3	0.37	0.045	0.009	0.075	0.015
AL-9	1.7	5.5	OD(3)	0.4	0.06	-	-	-	-
AL-11	1.7	5.5	TF1(3)	6.2	0.65	-	-	-	-
AL-12	1.8	5.0	TF2(BL)	12.1	0.59	-	-	-	-
AL-1	2.3	6.7	PF(1)	5.0	0.64	0.045	0.009	0.065	0.013
AL-4	2.3	6.7	PF(1-2)	5.3	0.36	0.045	0.009	0.130	0.026
AL-7	2.3	6.7	PF(2)	5.0	0.30	0.039	0.006	0.087	0.013
AL-3	3.0	6.7	PF(1)	3.6	0.23	0.045	0.009	0.103	0.021
AL-6	3.0	6.7	PF(2)	3.8	0.27	0.039	0.006	0.062	0.009
AL-10	3.5	7.7	PF(3)	2.3	0.07	0.034	0.006	0.100	0.017
AL-5	3.8	6.7	PF(2)	3.6	0.53	0.039	0.006	0.051	0.008
AL-13	7.0	7.7	PF(BL)	3.4	0.13	0.052	0.011	0.064	0.014

TABLE 38

TABLE 39

SUMMARY OF OXIDATION DITCH CHEMICAL USAGE
(Mead-FWQA Project on Biological Treatment)

Test	TEST CONDITIONS: Deten. Time (days)	Depth (feet)	System Feed	Organic Loading (ppd/1000cf)	(F/M Ratio)	EDITED TEST RESULTS: Lb.N/Lb. Applied BOD_5	LB.P/Lb. Applied BOD_5	Lb.N/Lb. Removed BOD_5	Lb.P/Lb. Removed BOD_5
OXIDATION DITCH TESTS WITHOUT CLARIFICATION									
OD-2	2	7.0	PF(1)	6.2	0.36	0.045	0.009	0.079	0.016
OD-1	3	6.7	PF(1)	4.4	0.44	0.045	0.009	0.067	0.013
OXIDATION DITCH TESTS WITH CLARIFICATION AND SLUDGE RECYCLE									
OD-4	1	4.0	PF(2)	15.4	1.04	0.039	0.006	0.060	0.009
OD-6	1	5.2	PF(2-3)	12.4	0.14	0.039	0.006	0.045	0.007
OD-3	1	7.0	PF(1-2)	12.7	0.33	0.045	0.009	0.056	0.011
OD-5	2	4.0	PF(2)	6.5	0.04	0.039	0.006	0.049	0.007
OD-9	2	4.3	TF2(BL)	13.3	0.33	-	-	-	-
OD-10	2	4.3	TF1(BL)	8.5	0.09	-	-	-	-
OD-7	2	5.2	PF(3)	6.2	0.06	0.034	0.006	0.036	0.006
OD-8	2	8.6	PF(3)	6.0	0.05	0.034	0.006	0.038	0.007

SECTION XI

PROCEDURES

Operation Procedures

Black Liquor Addition

During the final four months of the project, kraft black liquor was added to the Pilot Feed to increase the BOD_5 from approximately 200 to around 500 mg/l. The black liquor was digester blow-down containing 15 to 20 percent total solids and had an average BOD_5 of 35,000 mg/l.

The black liquor flowed by gravity from the mill storage tank to a 50-gallon gauging box at the base of the tank. The gauging box liquor level was controlled by a BW Floatless Liquid Level Control System consisting of 3 stainless steel electrodes (upper level, lower level and ground) mounted on the gauging box, a BW Relay and 2 solenoid valves located in the pipe connecting the black liquor tank and gauging box.

The liquor was pumped from the gauging box with a MOYNO Pump through 1/2 inch black iron pipe to the 4 inch Pilot Feed line approximately 700 feet distant. This junction point was several hundred feet from the flow splitting box, thereby resulting in adequate mixing of the black liquor and mill clarified effluent before addition to the pilot units.

Defoamer Addition

Approximately 700 pounds of Hodag FD-62 defoamer were added to the pilot units during the project. The defoamer was added when needed, rather than on a continuous basis as were the nutrients. The bulk of the defoamer addition occurred during the final four months when black liquor was being added to the pilot feed.

The defoamer was added to the Aerated Lagoon at the aerator. The Oxidation Ditch addition was made just downstream from the brush aerator. When required for the filters, it was added in the flow splitting box. A normal dose which was added manually was 2 to 3 gallons for each unit when needed.

Flow Measurement

Flows into each system were measured by V-notch weirs at the flow splitting box each weekday morning. Flows into the lagoon and Oxidation Ditch were infrequently double checked using a five-gallon bucket and stopwatch. Effluent rate from the ditch was also checked by the bucket and stopwatch method.

Main Feed Pump Operation

The two main feed pumps (mill clarified effluent and bleach effluent) each had a recording clock which accumulated the actual hours of operation for the pumps. Normally the clocks were reset to 0 hours at a specified time each morning, and the percent operating time was calculated for the previous day. This recorded evidence of pilot feed downtime was used in editing test data.

Nutrient Addition

Nutrients were added to the main feed to maintain a total dosage of 100:5:1 (BOD:N:P).

The actual ratios by Project Quarters were:

100:4.5:0.9 for first quarter
100:3.9:0.6 for second quarter
100:3.4:0.6 for third quarter
100:5.2:1.1 for last quarter

Nitrogen was obtained from 26°Be aqua ammonia, and was added direct from the drum. Phosphorus was obtained from 75 percent phosphoric acid (H_3PO_4) which was diluted 1 to 8 with water in order to obtain a pumping rate comparable to the ammonia (approximately 30 ml/min.). Pumping was done with a dual plexiglas head pump by Precision Pump Corporation. Rates were checked daily to insure proper addition.

Power Consumption

Power readings on the brush aerator and surface aerator were obtained on three-phase wattmeters connected to the respective units. Monthly readings on all pumps, lights and other uses were taken by the Chillicothe Area Electrical Department to determine kilowatt hours used per month for the project.

Sampling

Samples of main feed, pilot feed and effluent from each system were obtained using twelve minute interval timers and Little Giant submersible pumps. The sampling period was sixteen hours per day (4 P.M. to 8 A.M.). Samples were generally collected four days per week.

Test Procedures

Ammonia Nitrogen

The distillation method for ammonia nitrogen was used. This method is found in Standard Methods For The Examination of Water, Sewage and Industrial Wastes, 12th Edition, 1965 (hereinafter designated "Standard Methods"), pp. 391-92. Boric acid was used as the receiver in the total and ammonia nitrogen testing.

Apparent Color

This test was performed on a Bausch & Lomb Spectronic 20 using one-inch tubes, 400 millimicron wavelength, and platinum cobalt standard. Apparent color was run on the sample as received. True color is obtained by centrifuging the sample, adjusting the pH to 7.6, and reading the supernatant solution. All color values obtained during the project were apparent color.

BOD_5

Five-Day Biochemical Oxygen Demand tests were performed essentially as stated in Standard Methods, pp. 415-21. Three hundred (300) ml bottles were used for the tests. A 20°C water bath was substituted for the refrigerator-incubator on August 1, 1968. An average of 184 IDO values of dilution water showed 7.8 mg/1. After 5 days incubation, the dilution water showed an average Dissolved Oxygen (D.O.) of 7.3 mg/1, resulting in 0.5 mg/1 depletion due to seed.

The seed used was Paint Creek water above the mill clarifier outfall. Amounts used ranged from 2.5 to 5.0 percent to keep the desired depletion within 0.2 to 0.6 mg/1.

A standard glucose-glutamic acid solution (BOD_5 of 221 $\pm$ 10) was checked frequently, resulting in an average value of 216 mg/1.

The initial D.O. in the sample and the D.O. in the seeded dilution water after five days incubation were used to get the initial D.O. in calculating BOD_5 results.

COD

Chemical Oxygen Demand tests were performed essentially as stated in Standard Methods, pp. 510-14. The only modification was in the addition of 1 gram of silver sulfate into the reflux flask rather than adding 22 grams into the 9 pound bottle of sulfuric acid.

Dissolved Oxygen (see Temperature and Dissolved Oxygen)

Dye Studies

Tracer studies were conducted on each pilot unit using Rhodamine B fluorescent dye. This dye was in acetic acid solution and had a solids content of 40 percent.

The dye concentrations as fluorescence in the pilot units were read on a Model 111 Fluorometer supplied by G. K. Turner Associates.

Fluorometer readings were taken both manually and by recording chart. Chart speed was varied from one inch per minute to one inch per hour, depending on the unit tested. During the early stage of each test, one inch per minute recordings and manual readings were taken simultaneously to insure accurate measurement. A continuous flow-through door was utilized in the fluorometer for all the dye studies.

Kjeldahl Nitrogen

The procedure for this test is the total Kjeldahl method as described in Standard Methods, pp. 402-04. The only deviation from the standard tests was in using a new indicator specially made for ammonia. This is a commercial product called N-point, available from Mathieson-Coleman-Bell.

Long Term BOD-Jug Method

This test was performed in the following manner:

1. Prepared 16 liter mixture of sample and dilution water containing seed and nutrients. The ratio of sample to water was dependent upon the BOD concentration of the sample.

2. Added the above mixture to a 5-gallon carboy and aerated to a D.O. level of 7 to 8 mg/l.

3. Filled 6 BOD bottles from carboy by siphon technique. Placed open carboy and the 6 filled and stoppered BOD bottles into a 20°C incubator.

4. Winkler tests were run daily on 2 of the BOD bottles and the average residual D.O. was recorded.

5. When the D.O. dropped to a concentration of 1 to 2 mg/l, the remaining bottles were poured back into the carboy and reaerated to a D.O. of 7 to 8 mg/l. After reaeration, the 6 BOD bottles were filled and placed in the incubator. Daily Winkler tests were initiated again. This cycle was repeated until the desired number of incubation days was obtained, usually 20 to 30 days. The YSI polarographic D.O. test was used in place of the Winkler method for the long term BOD studies initiated August 20, 1969.

Nitrate Nitrogen

This determination was made by the polarographic method using the Sargent Manual Polarograph, Model III, and is essentially the test as shown in Standard Methods, pp. 398-400. All samples submitted to chemical testing for nitrogen were preserved with 0.8 ml sulfuric acid per liter of sample.

Oxygen Uptake Studies

These studies were conducted as described on pages 15-16 of The Instructions For YSI Model 54 Oxygen Meter. Yellow Springs Instrument Company of Yellow Springs, Ohio supplied the Model 54 D.O. meter and 5420A D.O. bottle probe. This probe was equipped with a rotary stirrer and automatic temperature compensator.

The previously calibrated probe was placed into a 300 ml BOD bottle containing the sample. Initial D.O. and temperature readings were taken. Readings were then taken every 15 minutes until the D.O. level dropped to 1 to 3 mg/l. The probe was kept in the sample in order to prevent atmospheric oxygen from being absorbed. The sample was stirred continually during the test period.

The above procedure was altered as follows when six AL sample points were run simultaneously. Each sample was placed into a BOD bottle which was stoppered to prevent air entry. Each sample bottle was placed on a separate magnetic stirrer for continual mixing. In order to prevent temperature increase from the magnetic stirrer motor, the bottle was placed in a beaker of water. When sample temperature started to rise, ice was added to this water bath. Constant temperature control was very satisfactory using this technique.

pH

A Beckman Zeromatic pH meter was used for pH testing. The meter was standardized daily with pH 6.86 buffer solution.

Settleable Solids

This test was done as described in Standard Methods, pp. 425-26. Sludge settleable solids were run for 30 minutes instead of the conventional one hour.

Temperature and Dissolved Oxygen

Dissolved oxygen in the field was measured by the polarographic method using a YSI Model 51 Oxygen Meter by Yellow Springs Instrument Company. This meter was calibrated in saturated air at the sample temperature. Occasionally a Winkler test was also run for comparison. This test was done as described in Standard Methods, pp. 405-10, and is called the azide modification of the Winkler test. Temperatures were taken with the thermistor on the YSI meter.

Total Phosphate

Sample was wet ashed before starting test. The phosphate test is derived from Standard Methods, pp. 234-36. It has been modified from Boltz by substituting sodium molybdate and hydrazine sulfate for ammonium molybdate and stannous chloride, respectively. A blue color is formed which is read on the DK-2 Beckman Spectrophotometer at 830 millimicrons. During the first quarter all soluble nutrient tests were centrifuged for 30 minutes at 85 G's. Tests were run on the supernatant liquid.

For the remainder of the project, the samples were filtered through glass fiber filters as in the suspended solids procedure. Tests for soluble nutrients were performed on the filtrate.

Total and Volatile Suspended Solids

These tests were performed as described in Standard Methods, pp. 424-25, except for the use of glass fiber filters instead of the asbestos mat. Sample volume was 50 ml, rather than 100 ml. A Mettler One Pan Automatic Balance weighing to 4 places was used.

Total and Volatile Total Solids

Standard Methods, page 423, gives the procedure used for testing of total solids. The Mettler balance was used for weighing.

Velocities and Sludge Depth

Flow direction and velocity were obtained in the Oxidation Ditch and Lagoon using the Marine Advisors Q-9 Current Meter.

Sludge depths in the ditch and lagoon were obtained using a photoelectric cell fabricated by the Mead Research Instrument Department.

Data Calculations

All daily solids (total and suspended) and BOD_5 computations were submitted to the Computer Group for calculation and tabulation on the digital computer. The raw data were submitted approximately every three weeks, which resulted in a short time lag in obtaining final results; however, this presented no problem in coordinating the data.

SECTION XII

ACKNOWLEDGMENTS

This project covered over three years from conception to final report. It was necessary to utilize the talents of many people to bring the project to successful completion. These persons are acknowledged for their direct involvement in some phase of the project:

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Karl C. Ayers, project leader for the first year of the project, who later organized and wrote much of the final report;

Thomas H. Patton, Jr., final project leader, who later helped organize much of the data, and wrote the mathematical modeling sections of this report;

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Special acknowledgment goes to Ralph H. Scott, Project Officer for FWQA, who gave encouragement and advice to all project leaders and helped to bring the project to a successful conclusion. Project support was provided by the Industrial Pollution Control Branch of the Environmental Protection Agency.

SECTION XIII

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SECTION XIV

GLOSSARY OF TERMS

A_v	Specific area of the filter media (square foot/cubic foot); used in mathematical modeling.
AL	Pilot Aerated Lagoon. Symbol was used primarily in designating test series; i.e., AL-1 meant test series one on the Pilot Aerated Lagoon.
BOD:N:P	BOD to Nitrogen to Phosphorus ratio on weight basis for nutrient addition.
BOD_5	Conventional 5-day biochemical oxygen demand.
BOD	Conventional 5-day biochemical oxygen demand unless long term BOD is so stated, i.e., 21-day BOD.
°C	Degrees Celcius (formally Centigrade).
CL1	Clarifier 1, cone-shaped clarifier used only with Trickling Filter 1.
CL2	Clarifier 2, Rex Rim Flow clarifier used with Trickling Filter 2, or Oxidation Ditch, depending upon test period and sequence.
D	Depth (feet) of Aeration Basin or Trickling Filter; used in mathematical modeling.
D.O.	Dissolved Oxygen.
Equil.	Equilibrium period. Symbol was used primarily in designating extent of test series set aside after changing operational parameters in order to acclimate the biological process to the new conditions.
F/M Ratio	Food (BOD_5 loading in pounds per day per volume) to Microorganisms (bacteria as mixed liquor volatile suspended solids in pounds).
gpd	Gallons per day flow rate.
gpd/sf	Gallons per day per square foot of surface area.
gpm	Gallons per minute flow rate.
hp-hr	Horsepower hour.

K	Overall biological rate constant determined from experimental results; used in mathematical modeling.
k	Biological rate constant used in mathematical modeling.
Kjeld. N	Total Kjeldahl nitrogen. This is organic nitrogen plus ammonia nitrogen, but does not include nitrate nitrogen.
KWH	Kilowatt hours of electrical energy.
MC	Mill clarifier effluent from the Chillicothe Division of The Mead Corporation which served as influent to the pilot treatment plant. MC is not to be confused with PF which was the same wastewater after supplemental nutrients had been added.
MGD	Million gallons per day flow rate.
mg/l	Milligram per liter.
MLVSS	Mixed liquor volatile suspended solids (see X_v).
ml/l	Milliliter per liter in one hour or 1/2 hour for sludge.
ml/l/hr	Milliliter per liter in one hour.
N	Percent recirculation divided by 100; used in mathematical modeling.
n	Hydraulic exponent determined from flow tracer studies; used in mathematical modeling.
Net hp	Gross horsepower required for aerators minus no load horsepower.
Net hp/1000 gallons	Net horsepower applied per 1000 gallons volume in aeration basins.
NH_3-N	Ammonia expressed as nitrogen.
NO_3-N	Nitrate expressed as nitrogen.
OD	Pilot Oxidation Ditch. Symbol was used primarily in designating test series.
PF	Pilot Feed, influent to pilot plant after supplemental nutrients had been added.

ppd	Pounds per day.
ppd/1000 cf	Pounds per day per 1000 cubic feet of volume.
PO_4-P	Phosphate expressed as phosphorus.
PVC	Polyvinyl chloride plastic media.
Q	Hydraulic loading as gallons per minute or per day per square foot; used in mathematical modeling.
S_a	BOD_5 (mg/l) of incoming wastewater to the treatment unit; used in mathematical modeling.
S_e	BOD_5 (mg/l) of effluent from the treatment unit; used in mathematical modeling.
S_o	BOD_5 (mg/l) of incoming wastewater to the treatment unit including dilution effect of recycle in the case of the trickling filters; used in mathematical modeling.
SVI	Sludge Volume Index.
T	Temperature (°C) of the biological process; used in mathematical modeling.
t	Detention time (days) of the treatment unit or expression of exposure time in trickling filter; used in mathematical modeling.
TF1	Trickling Filter 1 which recycled sludge. Symbol was used primarily in designating test series.
TF2	Trickling Filter 2 which recycled effluent or filtrate. Symbol was used primarily in designating test series.
θ	Temperature coefficient; used in mathematical modeling.
X_v	Volatile suspended solids (mg/l) under contact in the system and is intended as an expression of the active biological mass; used in mathematical modeling.

SECTION XV

APPENDIX

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DRAINAGE FREQUENCY OF AERATION BASINS
(Mead-FWQA Project on Biological Treatment)

Test Period	Test	System	Date	
			Drain	Fill
First	AL-Equil 1	AL		6-6-68
	OD-Equil 1	OD		6-6-68
	OD-Equil 2	OD	8-12-68	8-14-68
	-	CL2	8-29-68	9-4-68 (changing clarifier to OD from TF2)
	Contingency	OD + CL2	10-10-68	10-23-68
	OD-Equil 3	CL2	11-3-68	11-4-68
	-	OD + CL2	12-11-68	12-13-68 (OD-3 ended 12-6-68)
Second	OD-Equil 4	CL2	2-26-69	2-27-69
	OD-4	CL2	3-12-69	3-13-69
	OD-4	CL2	3-23-69	3-24-69
	OD-Equil 5	CL2	4-2-69	4-4-69
	Contingency	OD	4-11-69	4-13-69
	OD-6	CL2	6-4-69	6-5-69
Third	OD-7	CL2	8-4-69	8-5-69
	OD-7	CL2	8-11-69	8-13-69
	AL-Equil 11	AL	10-11-69	10-14-69
	No Testing	OD + CL2	10-11-69	12-1-69
	No Testing	CL2	12-8-69	12-9-69
	No Testing	AL	12-18-69	Drained from 5.5' to 5.0'
	No Testing	OD + CL2	12-18-69	-
Fourth	OD-Equil 9	OD + CL2	-	1-6-70
	OD-Equil 10	CL2	3-8-70	3-10-70

TABLE 40

SLUDGE WASTING PROGRAM ON CLARIFIER 1
(Mead-FWQA Project on Biological Treatment)

Date	Test No.	Sludge Wasted gpd	Remarks
Dec. 1968	End of TF1-7	ALL	CL1 pumped out by Septic Tank Service in preparation for 2nd Test Period
3-21-69 thru 3-23-69	TF1-9	50	Measured in 50 gal.drum
3-24-69 thru 4-1-69	TF1-9	100	
4-2-69	TF1-9	700	
4-3-69 thru 4-9-69	TF1-9	100	
4-10-69	End of TF-9	ALL	CL1 pumped out by Septic Tank Service
5-10-69 thru 5-28-69	TF1-11	50	
5-29-69	TF1-12	1300	Sludge Spill
5-30-69 thru 6-11-69	TF1-12	100	
6-12-69	TF1-12	300	
6-16-69 thru 7-3-69	TF1-13	100	
7-9-69	End of TF1-13	ALL	CL1 pumped out by Septic Tank Service
7-14-69 thru 8-31-69	TF1-14	100	
9-1-69 thru 10-12-69	TF1-15		
10-13-69 thru 12-19-69	TF1-16	-	CL1 eliminated for this test
2-25-70	TF1-17	ALL	Pumped out by MEAD. No recycle - just let sludge build up, then pumped out.
3-9-70 thru 3-19-70	TF1-18	100	
3-20-70	TF1-18	660	
3-23-70	TF1-18	3300	
3-24-70 thru 5-1-70	TF1-18	100	

TABLE 41

Explanation of Information in TABLES 42 Through 111

Reference is made to TABLE 42 (next page). The title "SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1-1" shows that this was the first test performed on Trickling Filter 1. The influent or feed source was PF meaning Pilot Feed.

AVERAGE OF ALL DATA, INFLUENT and EFFLUENT values were for the entire test period as shown - 6/10/68 through 7/28/68.

EDITED DATA AVERAGES, INFLUENT and EFFLUENT, EFFLUENT MINIMUMS and MAXIMUMS, and % REDUCTION were taken from 7/3/68 to 7/19/68 as shown. There were twenty parameters tested, of which, for example, the BOD_5 (mg/1) "mixed" showed an all data average influent of 204 derived from (15) values, and an average effluent BOD_5 of 58 mg/1 from (14) values.

The edited data average BOD_5 showed an influent of 224 mg/1 and an effluent of 73 mg/1. Each number was derived from (6) values.

The range of the edited effluent BOD_5 values was 52 to 87 mg/1.

The % reduction of the unit for BOD_5 was 67.5 based on edited influent and effluent.

Explanation of Information in SHEETS 1 through 60

Reference is made to SHEET 1 (page 203). The title "LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED" refers to all individual data obtained during the project and is tabulated by date with test parameters identified in the first column and feed and system effluents identified across the top of each day's block.

The four blocks in SHEET 1 contain the data for 6-21-68, 6-26-68, 6-28-68, and 7-3-68, respectively. No routine data were recorded for dates not listed.

The edited deletions are indicated by the word "DELETE" and pertain to all data for that system on that date. For example, AL data were deleted in total on 6-21-68 and 6-28-68, principally because acclimation was not yet achieved in the opinion of the Project Leader. The test summaries (TABLES 42 through 111) contain averages with and without the deleted data included so it is possible to see the effect of deletions if desired.

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 1
(MEAD-FWOA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 6/10/68 THROUGH 7/28/68 WITH EDITED AVERAGE FROM 7/ 3/68 TO 7/19/68

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.2(15)	0.0(0)	22.4(6)	22.0	23.5		
DEPTH(FT)	0.0(0)	24.0(15)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	22.6(15)	0.0(0)	23.0(6)	22.2	25.0		
D.O.(MG/L)	2.9(8)	2.6(3)	2.5(4)	1.5(1)	1.5	1.5		
TEMP(DEG C)	37(8)	32(8)	36(4)	31(4)	28	34		
BOD5(MG/L)								
MIXED	204(15)	58(14)	224(6)	73(6)	52	87	67.5	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1019(13)	1024(5)	1070(6)	1086(1)	1086	1086	-1.5	
TOTAL VOLATILE	331(13)	318(5)	357(6)	396(1)	396	396	-10.8	
SUSPENDED	235(14)	247(6)	199(6)	242(1)	242	242	-21.3	
VOLATILE SUSP.	109(13)	99(6)	104(6)	70(1)	70	70	32.2	
SETT.SOLIDS(ML/L)	0.5(10)	1.0(12)	1.0(4)	1.2(5)	0.0	4.7		
APPARENT COLOR	1265(11)	955(12)	1460(5)	1087(5)	800	1475	25.5	
PH	7.6(12)	7.3(11)	7.5(6)	7.3(5)	7.0	7.6	2.6	
AMMONIA N(MG/L)	5.7(12)	2.0(12)	5.2(6)	1.8(6)	0.0	3.4	64.7	
PHOSPHATE P(MG/L)	0.8(12)	0.5(12)	1.0(6)	0.7(6)	0.2	1.0	28.5	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.9(8)	0.0(0)	1.3(3)	0.3	3.0		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	0.0(0)	790.0(2)	0.0(0)	0.0(0)				

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 42

TABLE 43

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 2
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 7/29/68 THROUGH 8/18/68 WITH EDITED AVERAGE FROM 8/ 5/68 TO 8/18/68

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	33.2(8)	0.0(0)	33.2(6)	33.3	33.3		
DEPTH(FT)	0.0(0)	24.0(8)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	33.2(8)	0.0(0)	33.2(6)	33.3	33.3		
D.O.(MG/L)	4.0(6)	0.1(6)	4.0(5)	0.1(5)	0.0	0.4		
TEMP(DEG C)	37(6)	33(6)	37(5)	33(5)	30	35		
BOD5(MG/L)								
MIXED	195(8)	102(8)	207(6)	111(6)	75	136	46.3	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1584(7)	1254(8)	1496(5)	1294(6)	1046	1452	13.5	
TOTAL VOLATILE	587(7)	436(8)	558(5)	457(6)	374	567	18.2	
SUSPENDED	389(7)	325(8)	417(5)	355(6)	142	438	14.9	
VOLATILE SUSP.	147(7)	150(8)	156(5)	152(6)	70	190	2.4	
SETT.SOLIDS(ML/L)	0.4(7)	1.7(7)	0.2(5)	1.2(5)	0.2	2.3		
APPARENT COLOR	2126(5)	1659(6)	2160(4)	1566(5)	980	2055	27.5	
PH	8.1(7)	7.4(8)	8.1(5)	7.5(6)	7.4	7.6	7.4	
AMMONIA N(MG/L)	10.1(6)	5.0(8)	11.0(5)	5.4(6)	0.3	23.1	50.0	
PHOSPHATE P(MG/L)	1.8(6)	1.1(8)	1.2(5)	1.0(6)	0.2	2.2	19.2	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.1(6)	0.0(0)	0.1(5)	0.0	0.4		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	0.0(0)	162.0(5)	0.0(0)	150.0(3)	120.0	200.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 3
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 8/19/68 THROUGH 9/ 8/68 WITH EDITED AVERAGE FROM 8/21/68 TO 9/ 8/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	43.7(6)	0.0(0)	43.7(6)	42.0	44.4		
DEPTH(FT)	0.0(0)	24.0(6)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	44.2(6)	0.0(0)	44.2(6)	44.0	44.4		
D.O.(MG/L)	2.1(6)	0.0(0)	2.6(5)	0.0(0)				
TEMP(DEG C)	39(6)	35(5)	38(5)	35(5)	31	39		
BOD5(MG/L)								
MIXED	180(6)	110(6)	190(5)	110(6)	69	163	42.1	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1437(6)	1296(6)	1418(5)	1296(6)	1068	1547	8.5	
TOTAL VOLATILE	581(6)	510(6)	585(5)	510(6)	351	692	12.7	
SUSPENDED	386(6)	282(6)	390(5)	282(6)	176	468	27.6	
VOLATILE SUSP.	163(6)	167(6)	151(5)	167(6)	120	218	-10.7	
SETT.SOLIDS(ML/L)	5.4(6)	1.2(6)	6.2(5)	1.2(6)	0.3	2.0		
APPARENT COLOR	1668(6)	1297(6)	1667(5)	1297(6)	650	2100	22.2	
PH	8.4(6)	7.5(6)	8.4(5)	7.5(6)	7.2	7.8	11.1	
AMMONIA N(MG/L)	3.7(6)	2.7(6)	2.7(5)	2.7(6)	0.0	9.0	0.0	
PHOSPHATE P(MG/L)	3.0(6)	1.9(6)	3.6(5)	1.9(6)	0.9	2.9	46.7	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.4(5)	0.0(0)	0.4(5)	0.2	1.0		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	0.0(0)	9.9(6)	0.0(0)	9.9(6)	0.4	31.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 44

TABLE 45

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 4
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 9/ 9/68 THROUGH 10/ 6/68 WITH EDITED AVERAGE FROM 9/23/68 TO 10/ 6/68

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	11.2(10)	0.0(0)	11.1(6)	11.1	11.1		
DEPTH(FT)	0.0(0)	24.0(10)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	10.6(10)	0.0(0)	11.1(6)	11.1	11.1		
D.O.(MG/L)	3.6(6)	0.0(0)	4.2(5)	0.0(0)				
TEMP(DEG C)	38(6)	26(7)	38(5)	25(5)	21	29		
BOD5(MG/L)								
MIXED	205(9)	49(9)	209(7)	43(6)	21	72	79.5	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1286(9)	1009(10)	1269(7)	954(6)	869	1035	24.8	
TOTAL VOLATILE	439(9)	302(10)	431(7)	264(6)	251	270	38.8	
SUSPENDED	432(9)	159(10)	420(7)	111(6)	20	196	73.5	
VOLATILE SUSP.	173(9)	90(8)	172(7)	73(4)	14	94	57.8	
SETT.SOLIDS(ML/L)	1.1(10)	1.9(7)	1.5(7)	0.4(3)	0.2	0.8		
APPARENT COLOR	1617(8)	790(9)	1555(7)	752(5)	560	975	51.6	
PH	8.0(6)	7.5(9)	8.0(6)	7.4(5)	7.4	7.6	7.0	
AMMONIA N(MG/L)	6.6(7)	3.8(10)	6.6(7)	3.5(6)	0.6	6.4	46.7	
PHOSPHATE P(MG/L)	1.8(7)	1.5(10)	1.8(7)	1.2(6)	0.7	1.6	33.2	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	1.6(7)	0.0(0)	2.0(5)	0.4	4.5		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	0.0(0)	1.4(3)	0.0(0)	0.9(2)	0.3	1.5		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 5
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 10/ 7/68 THROUGH 10/27/68 WITH EDITED AVERAGE FROM 10/14/68 TO 10/27/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.1(9)	0.0(0)	22.2(5)	22.2	22.2		
DEPTH(FT)	0.0(0)	24.0(9)	0.0(0)	24.0(5)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	22.1(9)	0.0(0)	22.2(5)	22.2	22.2		
D.O.(MG/L)	5.5(6)	0.2(4)	5.3(4)	0.2(4)	0.0	0.5		
TEMP(DEG C)	36(5)	30(8)	36(3)	31(5)	30	32		
BOD5(MG/L)								
MIXED	207(9)	72(9)	200(6)	80(5)	56	106	60.0	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1328(8)	1110(9)	1334(5)	1144(5)	1069	1232	14.2	
TOTAL VOLATILE	471(8)	340(9)	464(5)	359(5)	305	427	22.7	
SUSPENDED	399(9)	281(9)	413(6)	312(5)	198	456	24.5	
VOLATILE SUSP.	180(9)	133(9)	179(6)	144(5)	90	250	19.5	
SETT.SOLIDS(ML/L)	1.1(8)	3.2(9)	1.4(6)	4.3(5)	1.0	9.0		
APPARENT COLOR	1596(7)	1036(9)	1675(5)	1030(5)	725	1250	38.5	
PH	6.8(8)	7.5(9)	7.8(5)	7.5(5)	7.2	7.8	4.0	
AMMONIA N(MG/L)	15.0(9)	4.9(9)	4.4(6)	4.4(5)	3.0	5.9	0.1	
PHOSPHATE P(MG/L)	1.4(9)	1.5(9)	1.1(6)	1.4(5)	1.2	1.8	-25.2	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.3(8)	0.0(0)	0.1(5)	0.0	0.3		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	0.0(0)	207.3(6)	0.0(0)	210.2(4)	125.0	256.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 46

TABLE 47

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 6
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 10/28/68 THROUGH 11/17/68 WITH EDITED AVERAGE FROM 11/ 6/68 TO 11/17/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	29.5(8)	0.0(0)	29.5(7)	29.6	29.6		
DEPTH(FT)	0.0(0)	22.0(8)	0.0(0)	22.0(7)	22.0	22.0		
RECYCLE(GPM)	0.0(0)	0.0(8)	0.0(0)	0.0(7)	0.0	0.0		
D.O.(MG/L)	6.0(6)	0.1(1)	6.3(5)	0.0(0)				
TEMP(DEG C)	36(6)	23(6)	36(5)	22(5)	20	24		
BOD5(MG/L)								
MIXED	224(8)	115(8)	216(7)	112(7)	87	165	48.1	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1413(8)	1045(8)	1405(7)	1031(7)	0	1454	26.6	
TOTAL VOLATILE	579(8)	404(8)	569(7)	400(7)	0	655	29.6	
SUSPENDED	493(8)	289(8)	484(7)	293(7)	170	444	39.4	
VOLATILE SUSP.	206(8)	141(8)	202(7)	144(7)	14	276	28.7	
SETT.SOLIDS(ML/L)	1.4(8)	0.2(7)	1.6(7)	0.3(6)	0.1	0.5		
APPARENT COLOR	2219(8)	1625(8)	2182(7)	1621(7)	900	2600	25.6	
PH	8.4(7)	7.5(8)	8.4(6)	7.5(7)	6.9	9.2	11.2	
AMMONIA N(MG/L)	11.8(8)	6.3(8)	12.7(7)	6.3(7)	4.3	7.7	50.5	
PHOSPHATE P(MG/L)	2.2(8)	1.5(8)	2.2(7)	1.5(7)	0.3	3.6	30.3	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	1.8(5)	0.0(0)	1.8(5)	0.1	4.9		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	0.0(0)	950.0(1)	0.0(0)	950.0(1)	950.0	950.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 7
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 11/18/68 THROUGH 12/ 6/68 WITH EDITED AVERAGE FROM 11/18/68 TO 12/ 6/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	14.7(10)	0.0(0)	14.7(9)	14.8	14.8		
DEPTH(FT)	0.0(0)	22.0(10)	0.0(0)	22.0(9)	22.0	22.0		
RECYCLE(GPM)	0.0(0)	0.0(10)	0.0(0)	0.0(9)	0.0	0.0		
D.O.(MG/L)	3.9(7)	1.0(3)	3.3(5)	1.0(3)	0.0	3.0		
TEMP(DEG C)	35(6)	21(7)	35(4)	21(6)	18	24		
BOD5(MG/L)								
MIXED	239(10)	107(10)	216(8)	105(9)	78	139	51.6	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1328(10)	1804(10)	1167(8)	1853(9)	1125	4724	-58.8	
TOTAL VOLATILE	479(10)	790(10)	413(8)	824(9)	0	4188	-99.7	
SUSPENDED	439(10)	273(9)	338(8)	250(8)	98	326	25.9	
VOLATILE SUSP.	177(10)	135(8)	154(8)	131(7)	66	194	14.8	
SETT.SOLIDS(ML/L)	1.1(8)	1.1(9)	0.7(6)	1.1(8)	0.1	6.0		
APPARENT COLOR	2203(8)	1470(10)	1738(6)	1428(9)	850	1800	17.8	
PH	7.8(10)	7.3(10)	7.8(8)	7.3(9)	7.1	7.6	7.1	
AMMONIA N(MG/L)	8.5(10)	5.7(10)	8.3(8)	6.0(9)	3.9	8.1	27.5	
PHOSPHATE P(MG/L)	1.6(10)	1.1(10)	1.7(8)	1.2(9)	0.5	1.6	30.6	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	1.0(7)	0.0(0)	0.7(6)	0.1	1.5		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 48

TABLE 49

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 8
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 2/ 3/69 THROUGH 3/ 9/69 WITH EDITED AVERAGE FROM 2/26/69 TO 3/ 9/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	33.2(12)	0.0(0)	33.2(5)	33.3	33.3		
DEPTH(FT)	0.0(0)	24.0(12)	0.0(0)	24.0(5)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	33.2(12)	0.0(0)	33.2(5)	33.3	33.3		
D.O.(MG/L)	6.3(11)	0.0(0)	6.3(6)	0.0(0)				
TEMP(DEG C)	31(11)	23(10)	32(6)	22(5)	21	24		
BOD5(MG/L)								
MIXED	285(12)	183(12)	295(6)	153(5)	102	226	48.1	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1887(12)	1651(12)	1855(6)	1515(5)	1415	1602	18.3	
TOTAL VOLATILE	622(12)	455(12)	704(6)	469(5)	400	632	33.3	
SUSPENDED	462(12)	353(12)	491(6)	310(5)	170	416	36.9	
VOLATILE SUSP.	149(12)	148(12)	203(6)	144(5)	74	202	29.1	
SETT.SOLIDS(ML/L)	5.7(12)	1.0(12)	4.1(6)	0.8(5)	0.2	2.0		
APPARENT COLOR	2142(12)	1894(12)	2142(6)	1670(5)	1250	2200	22.0	
PH	7.4(11)	7.4(11)	7.5(6)	7.2(5)	7.0	7.6	2.8	
AMMONIA N(MG/L)	6.5(11)	1.8(3)	8.4(6)	0.0(0)				
PHOSPHATE P(MG/L)	2.5(11)	1.3(3)	2.6(6)	0.0(0)				
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.7(10)	0.0(0)	0.8(5)	0.5	1.7		
SOLIDS(MG/L)								
SUSPENDED	0(0)	8896(11)	0(0)	11308(5)	5990	17510		
VOLATILE SUSP.	0(0)	3410(11)	0(0)	4826(5)	2532	7899		
SLUDGE(ML/L)	0.0(0)	372.5(10)	0.0(0)	436.0(5)	110.0	770.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 9
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 3/10/69 THROUGH 4/ 6/69 WITH EDITED AVERAGE FROM 3/17/69 TO 4/ 6/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	44.3(16)	0.0(0)	44.3(11)	44.4	44.4		
DEPTH(FT)	0.0(0)	24.0(16)	0.0(0)	24.0(11)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	22.1(16)	0.0(0)	22.1(11)	22.2	22.2		
D.O.(MG/L)	5.9(13)	0.0(0)	5.7(9)	0.0(0)				
TEMP(DEG C)	31(13)	26(14)	31(9)	26(9)	24	29		
BOD5(MG/L)								
MIXED	212(16)	110(16)	207(12)	108(11)	66	137	47.9	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1989(15)	1847(16)	1808(11)	1995(11)	1271	6490	-10.3	
TOTAL VOLATILE	644(15)	463(16)	593(11)	464(11)	347	559	21.7	
SUSPENDED	543(15)	330(16)	538(11)	350(11)	202	580	34.9	
VOLATILE SUSP.	242(15)	160(16)	261(11)	172(11)	68	304	34.1	
SETT.SOLIDS(ML/L)	6.8(15)	1.5(16)	7.2(11)	0.8(11)	0.1	2.5		
APPARENT COLOR	1798(15)	1581(16)	1773(11)	1550(11)	1050	1900	12.5	
PH	7.6(11)	7.3(15)	7.7(9)	7.3(11)	6.9	7.9	5.3	
AMMONIA N(MG/L)	7.6(11)	3.3(4)	7.4(9)	3.7(3)	1.4	6.1	49.8	
PHOSPHATE P(MG/L)	2.9(11)	1.6(4)	2.9(9)	1.4(3)	1.3	1.8	50.9	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.3(14)	0.0(0)	0.3(9)	0.0	0.7		
SOLIDS(MG/L)								
SUSPENDED	0(0)	14056(14)	0(0)	14605(11)	11448	18902		
VOLATILE SUSP.	0(0)	6636(14)	0(0)	7025(11)	5375	8529		
SLUDGE(ML/L)	0.0(0)	402.0(15)	0.0(0)	469.0(11)	200.0	900.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 50

TABLE 51

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 10
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 4/14/69 THROUGH 5/ 4/69 WITH EDITED AVERAGE FROM 4/21/69 TO 5/ 4/69

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	29.5(8)	0.0(0)	29.5(5)	29.6	29.6		
DEPTH(FT)	0.0(0)	24.0(8)	0.0(0)	24.0(5)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	14.7(8)	0.0(0)	14.7(5)	14.8	14.8		
D.O.(MG/L)	5.4(6)	0.0(0)	5.3(5)	0.0(0)				
TEMP(DEG C)	32(6)	27(6)	33(5)	27(4)	25	28		
BOD5(MG/L)								
MIXED	245(8)	136(8)	212(6)	133(5)	89	183	37.4	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1525(8)	1617(8)	1471(6)	1466(5)	1285	1693	0.3	
TOTAL VOLATILE	574(8)	510(8)	548(6)	506(5)	359	693	7.8	
SUSPENDED	284(7)	513(8)	294(6)	604(5)	206	1656	-105.4	
VOLATILE SUSP.	166(7)	261(7)	168(6)	309(4)	70	802	-84.2	
SETT.SOLIDS(ML/L)	0.8(8)	4.5(8)	1.0(6)	4.7(5)	2.0	10.0		
APPARENT COLOR	1644(8)	1519(8)	1508(6)	1400(5)	1000	1800	7.1	
PH	7.7(7)	7.2(8)	7.6(5)	7.2(5)	7.0	7.5	5.7	
AMMONIA N(MG/L)	8.1(7)	4.8(2)	9.6(5)	4.2(1)	4.2	4.2	56.2	
PHOSPHATE P(MG/L)	2.8(7)	2.5(2)	2.9(5)	2.1(1)	2.1	2.1	29.9	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.4(6)	0.0(0)	0.5(4)	0.4	0.6		
SOLIDS(MG/L)								
SUSPENDED	0(0)	2890(8)	0(0)	2422(5)	202	6076		
VOLATILE SUSP.	0(0)	1405(8)	0(0)	1169(5)	0	2906		
SLUDGE(ML/L)	0.0(0)	79.3(8)	0.0(0)	58.0(5)	15.0	130.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 11
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 5/ 5/69 THROUGH 5/25/69 WITH EDITED AVERAGE FROM 5/14/69 TO 5/25/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.1(12)	0.0(0)	22.2(4)	22.2	22.2		
DEPTH(FT)	0.0(0)	24.0(12)	0.0(0)	24.0(4)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	22.1(12)	0.0(0)	22.2(4)	22.2	22.2		
D.O.(MG/L)	6.5(11)	0.0(0)	6.6(6)	0.0(0)				
TEMP(DEG C)	32(11)	26(12)	33(6)	26(4)	22	28		
BOD5(MG/L)								
MIXED	206(11)	64(11)	198(6)	62(3)	54	68	68.6	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1503(12)	1310(12)	1562(7)	1315(4)	1213	1358	15.8	
TOTAL VOLATILE	500(12)	363(12)	529(7)	382(4)	339	425	27.6	
SUSPENDED	329(12)	247(12)	397(7)	265(4)	206	310	33.4	
VOLATILE SUSP.	152(12)	110(12)	179(7)	135(4)	122	160	24.4	
SETT.SOLIDS(ML/L)	0.7(12)	1.7(12)	0.8(7)	1.6(4)	1.0	2.5		
APPARENT COLOR	1628(12)	1142(12)	1847(7)	1163(4)	1000	1300	37.0	
PH	7.3(12)	7.3(12)	7.2(7)	7.3(4)	7.2	7.7	-1.0	
AMMONIA N(MG/L)	12.4(12)	9.1(3)	11.7(7)	7.6(1)	7.6	7.6	35.1	
PHOSPHATE P(MG/L)	3.2(12)	1.6(3)	3.0(7)	1.6(1)	1.6	1.6	46.9	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	1.0(12)	0.0(0)	1.2(4)	1.0	1.5		
SOLIDS(MG/L)								
SUSPENDED	0(0)	7956(12)	0(0)	14166(4)	10160	18902		
VOLATILE SUSP.	0(0)	3652(12)	0(0)	6440(4)	4585	8967		
SLUDGE(ML/L)	0.0(0)	153.7(12)	0.0(0)	196.2(4)	55.0	340.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 52

TABLE 53

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 12
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 5/26/69 THROUGH 6/15/69 WITH EDITED AVERAGE FROM 6/ 2/69 TO 6/15/69

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	33.2(10)	0.0(0)	33.2(4)	33.3	33.3		
DEPTH(FT)	0.0(0)	24.0(10)	0.0(0)	24.0(4)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	33.2(10)	0.0(0)	33.2(4)	33.3	33.3		
D.O.(MG/L)	3.2(8)	0.0(0)	3.5(4)	0.0(0)				
TEMP(DEG C)	36(8)	33(9)	37(4)	33(4)	32	34		
BOD5(MG/L)								
MIXED	167(10)	79(10)	194(6)	101(4)	88	114	47.8	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1537(9)	1375(9)	1607(6)	1463(4)	1255	1585	8.9	
TOTAL VOLATILE	548(9)	426(9)	565(6)	454(4)	333	568	19.5	
SUSPENDED	404(9)	316(9)	487(6)	348(4)	192	570	28.4	
VOLATILE SUSP.	152(9)	152(9)	169(6)	161(4)	68	216	5.0	
SETT.SOLIDS(ML/L)	2.0(10)	2.3(10)	2.3(6)	3.7(4)	0.0	11.0		
APPARENT COLOR	1643(10)	1451(10)	1813(6)	1688(4)	1250	2000	6.9	
PH	7.0(8)	7.4(10)	7.0(5)	7.2(4)	7.0	7.5	-3.3	
AMMONIA N(MG/L)	7.5(8)	3.6(3)	7.0(5)	2.9(2)	2.0	3.9	57.9	
PHOSPHATE P(MG/L)	3.4(8)	3.2(3)	3.8(5)	3.8(2)	3.0	4.7	0.7	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.5(9)	0.0(0)	0.5(4)	0.5	0.6		
SOLIDS(MG/L)								
SUSPENDED	0(0)	15678(9)	0(0)	16851(4)	13428	19384		
VOLATILE SUSP.	0(0)	6585(9)	0(0)	7080(4)	6290	8126		
SLUDGE(ML/L)	0.0(0)	539.0(10)	0.0(0)	638.7(4)	355.0	920.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 13
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF2
TEST WAS FROM 6/16/69 THROUGH 7/ 3/69 WITH EDITED AVERAGE FROM 6/23/69 TO 7/ 3/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	22.1(11)	22.1(11)	22.2(6)	22.2(6)	22.2	22.2		
DEPTH(FT)	24.0(11)	24.0(11)	24.0(6)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	22.1(11)	22.1(11)	22.2(6)	22.2(6)	22.2	22.2		
D.O.(MG/L)	6.3(10)	0.0(0)	6.4(5)	0.0(0)				
TEMP(DEG C)	34(10)	31(11)	35(5)	32(6)	28	34		
BOD5(MG/L)								
MIXED	147(11)	85(10)	169(6)	87(6)	65	107	48.7	63.8
SETTLED	153(11)	0(0)	141(6)	0(0)				
SOLIDS(MG/L)								
TOTAL	1889(10)	1298(11)	2287(5)	1297(6)	1044	1451	43.2	13.8
TOTAL VOLATILE	520(9)	397(11)	536(4)	389(6)	309	491	27.5	25.5
SUSPENDED	398(10)	208(11)	380(5)	189(6)	10	434	50.3	45.1
VOLATILE SUSP.	201(9)	93(11)	175(4)	70(6)	2	176	60.1	48.9
SETT.SOLIDS(ML/L)	5.1(11)	0.7(11)	4.0(6)	0.9(6)	0.0	3.5		
APPARENT COLOR	1691(11)	1436(11)	1825(6)	1417(6)	1150	1700	22.3	28.5
PH	7.8(11)	7.8(11)	7.5(6)	7.5(6)	6.8	8.4	1.0	-1.5
AMMONIA N(MG/L)	14.1(6)	14.8(3)	14.9(3)	16.8(2)	11.3	22.4	-12.5	1.0
PHOSPHATE P(MG/L)	3.4(6)	4.1(3)	3.3(3)	4.6(2)	2.4	6.8	-36.6	15.2
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.6(11)	0.0(0)	0.6(6)	0.4	1.3		
SOLIDS(MG/L)								
SUSPENDED	0(0)	17992(10)	0(0)	19420(5)	17142	26702		
VOLATILE SUSP.	0(0)	7039(10)	0(0)	7485(5)	6481	9976		
SLUDGE(ML/L)	0.0(0)	850.4(11)	0.0(0)	805.8(6)	310.0	940.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 54

TABLE 55

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 14
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 7/14/69 THROUGH 8/31/69 WITH EDITED AVERAGE FROM 8/20/69 TO 8/31/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.1(16)	0.0(0)	22.2(6)	22.2	22.2		
DEPTH(FT)	0.0(0)	24.0(16)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	22.1(16)	0.0(0)	22.2(6)	22.2	22.2		
D.O.(MG/L)	2.2(13)	0.0(0)	2.6(6)	0.0(0)				
TEMP(DEG C)	36(13)	32(15)	37(6)	32(6)	32	33		
BOD5(MG/L)								
MIXED	198(17)	108(17)	201(6)	99(6)	78	140	50.6	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1261(17)	1146(16)	1268(6)	1186(6)	1081	1275	6.4	
TOTAL VOLATILE	483(17)	422(14)	490(6)	403(6)	351	503	17.8	
SUSPENDED	356(17)	891(17)	442(6)	1009(6)	44	4932	-128.3	
VOLATILE SUSP.	167(17)	269(14)	235(6)	469(4)	50	1452	-99.8	
SETT.SOLIDS(ML/L)	3.2(14)	1.4(14)	4.3(4)	2.1(4)	1.0	3.0		
APPARENT COLOR	1534(16)	2331(16)	1500(6)	1150(6)	900	1450	23.3	
PH	7.9(15)	7.6(15)	7.9(6)	7.6(6)	7.3	7.8	3.5	
AMMONIA N(MG/L)	9.8(16)	7.1(6)	3.2(6)	0.7(2)	0.1	1.4	77.0	
PHOSPHATE P(MG/L)	2.7(14)	5.1(6)	2.4(6)	2.3(2)	2.3	2.4	2.0	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.9(15)	0.0(0)	0.4(6)	0.2	0.8		
SOLIDS(MG/L)								
SUSPENDED	0(0)	991(16)	0(0)	1926(5)	96	7340		
VOLATILE SUSP.	0(0)	395(16)	0(0)	700(5)	60	2416		
SLUDGE(ML/L)	0.0(0)	36.9(14)	0.0(0)	47.4(5)	5.0	100.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 15
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 9/ 1/69 THROUGH 10/12/69 WITH EDITED AVERAGE FROM 10/ 1/69 TO 10/12/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	14.7(16)	0.0(0)	14.7(6)	14.8	14.8		
DEPTH(FT)	0.0(0)	24.0(16)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	74.0(16)	0.0(0)	74.0(6)	74.0	74.0		
D.O.(MG/L)	5.5(14)	0.0(0)	5.7(6)	0.0(0)				
TEMP(DEG C)	35(14)	29(14)	34(6)	29(5)	27	30		
BOD5(MG/L)								
MIXED	198(16)	46(16)	169(7)	46(6)	19	73	72.8	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1259(16)	1071(16)	1157(7)	1079(6)	782	1315	6.7	
TOTAL VOLATILE	497(16)	362(16)	483(7)	408(6)	242	581	15.5	
SUSPENDED	311(16)	211(16)	296(7)	226(6)	106	502	23.6	
VOLATILE SUSP.	162(12)	116(9)	195(4)	200(1)	200	200	-2.5	
SETT.SOLIDS(ML/L)	1.5(16)	0.7(16)	2.1(7)	1.2(6)	0.2	4.0		
APPARENT COLOR	1258(16)	873(16)	801(7)	777(6)	300	1310	3.0	
PH	8.1(16)	7.6(16)	8.2(7)	7.7(6)	7.4	8.2	6.5	
AMMONIA N(MG/L)	12.5(16)	1.8(4)	10.6(7)	2.8(1)	2.8	2.8	73.6	
PHOSPHATE P(MG/L)	2.1(15)	1.3(4)	2.6(7)	2.0(1)	2.0	2.0	25.1	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.5(14)	0.0(0)	0.4(5)	0.3	0.5		
SOLIDS(MG/L)								
SUSPENDED	0(0)	16191(16)	0(0)	15381(6)	7898	27408		
VOLATILE SUSP.	0(0)	7614(16)	0(0)	7299(6)	4004	13123		
SLUDGE(ML/L)	0.0(0)	913.3(15)	0.0(0)	854.0(5)	540.0	960.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 56

TABLE 57

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 16
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 10/13/69 THROUGH 12/19/69 WITH EDITED AVERAGE FROM 12/ 1/69 TO 12/19/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	66.6(27)	0.0(0)	66.6(11)	66.7	66.7		
DEPTH(FT)	0.0(0)	24.0(27)	0.0(0)	24.0(11)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	0.0(27)	0.0(0)	0.0(11)	0.0	0.0		
D.O.(MG/L)	5.1(25)	5.6(23)	5.1(10)	5.9(10)	5.3	6.9		
TEMP(DEG C)	32(25)	29(22)	31(10)	28(9)	26	30		
BOD5(MG/L)								
MIXED	291(27)	225(26)	291(11)	201(11)	162	264	30.9	
SETTLED	0.0(0)	188.6(26)	0.0(0)	184.8(11)	155.0	234.0		
SOLIDS(MG/L)								
TOTAL	2289(27)	1869(25)	1802(11)	1705(11)	1205	2077	5.3	
TOTAL VOLATILE	1169(27)	750(25)	654(11)	612(11)	372	1205	6.4	
SUSPENDED	444(27)	497(24)	326(11)	302(11)	136	468	7.2	
VOLATILE SUSP.	188(23)	241(19)	169(9)	159(8)	50	290	6.2	
SETT.SOLIDS(ML/L)	3.7(27)	5.7(26)	2.1(11)	3.3(11)	0.1	8.0		
APPARENT COLOR	1805(27)	1702(25)	1635(11)	1566(11)	1090	2200	4.1	
PH	7.5(27)	7.4(26)	7.3(11)	7.4(11)	6.6	8.5	-0.7	
AMMONIA N(MG/L)	13.5(19)	7.7(7)	14.4(9)	7.9(3)	1.1	13.2	45.4	
PHOSPHATE P(MG/L)	3.2(18)	2.2(7)	3.8(8)	2.1(3)	0.4	3.9	45.9	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 17
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS CL2

TEST WAS FROM 1/ 5/70 THROUGH 3/ 8/70 WITH EDITED AVERAGE FROM 1/28/70 TO 2/20/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	33.2(20)	33.2(20)	33.2(13)	33.2(13)	33.3	33.3		
DEPTH(FT)	0.0(0)	24.0(20)	0.0(0)	24.0(13)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	0.0(20)	0.0(0)	0.0(13)	0.0	0.0		
D.O.(MG/L)	0.0(0)	3.3(9)	0.0(0)	3.9(7)	1.0	9.6		
TEMP(DEG C)	0(0)	13(12)	0(0)	12(9)	4	25		
BOD5(MG/L)								
MIXED	82(18)	83(15)	104(11)	98(10)	53	141	5.7	82.6
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1984(18)	1960(15)	2191(11)	2117(10)	1771	2444	3.3	28.8
TOTAL VOLATILE	713(18)	720(15)	808(11)	781(10)	635	973	3.3	42.8
SUSPENDED	443(18)	298(15)	547(11)	337(10)	138	544	38.4	56.3
VOLATILE SUSP.	250(18)	201(15)	293(11)	227(10)	48	370	22.4	47.9
SETT.SOLIDS(ML/L)	1.4(18)	0.2(15)	1.8(11)	0.2(10)	0.0	1.5		
APPARENT COLOR	2608(18)	2369(15)	3137(11)	2718(10)	2150	3200	13.3	46.5
PH	7.7(18)	8.2(15)	7.9(11)	8.2(10)	7.8	9.1	-4.4	9.6
AMMONIA N(MG/L)	3.8(4)	12.1(2)	3.5(3)	13.1(1)	13.1	13.1	-270.7	32.3
PHOSPHATE P(MG/L)	6.0(3)	6.3(2)	6.3(2)	7.7(1)	7.7	7.7	-22.2	-45.5
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	1.7(3)	0.0(0)	1.0(2)	1.0	1.0		
SOLIDS(MG/L)								
SUSPENDED	933(3)	0(0)	933(3)	0(0)				
VOLATILE SUSP.	537(3)	0(0)	537(3)	0(0)				
SLUDGE(ML/L)	20.0(3)	0.0(0)	20.0(3)	0.0(0)				

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 58

TABLE 59

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF1 18
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF2

TEST WAS FROM 3/ 9/70 THROUGH 5/ 1/70 WITH EDITED AVERAGE FROM 4/13/70 TO 5/ 1/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	33.2(22)	33.2(22)	33.2(11)	33.2(12)	33.3	33.3		
DEPTH(FT)	24.0(22)	24.0(22)	24.0(11)	24.0(12)	24.0	24.0		
RECYCLE(GPM)	33.2(22)	33.2(22)	33.2(11)	33.2(12)	33.3	33.3		
D.O.(MG/L)	4.9(16)	0.0(0)	4.6(9)	0.0(0)				
TEMP(DEG C)	30(16)	28(16)	31(9)	30(10)	27	35		
BOD5(MG/L)								
MIXED	393(22)	272(20)	417(11)	273(12)	235	324	34.6	56.9
SETTLED	377(22)	0(0)	366(11)	0(0)				
SOLIDS(MG/L)								
TOTAL	2660(22)	2390(22)	2560(11)	2385(12)	1652	2836	6.8	9.3
TOTAL VOLATILE	1130(22)	1022(22)	1147(11)	1005(12)	126	1326	12.3	20.6
SUSPENDED	604(21)	522(21)	595(11)	510(11)	280	740	14.2	-0.7
VOLATILE SUSP.	380(21)	341(20)	399(11)	352(10)	264	468	11.7	-8.8
SETT.SOLIDS(ML/L)	2.1(22)	2.3(22)	2.5(11)	3.0(12)	1.6	7.0		
APPARENT COLOR	3921(22)	3682(22)	3765(11)	3648(12)	2780	4100	3.0	20.8
PH	8.6(22)	8.2(22)	8.4(11)	8.1(12)	7.6	8.4	3.9	11.2
AMMONIA N(MG/L)	18.4(6)	9.1(5)	18.0(2)	6.0(2)	2.1	9.9	66.6	55.1
PHOSPHATE P(MG/L)	7.2(6)	5.4(5)	7.8(2)	5.6(2)	3.9	7.3	28.2	36.6
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.7(16)	0.0(0)	0.7(10)	0.6	2.6		
SOLIDS(MG/L)								
SUSPENDED	0(0)	7567(18)	0(0)	2323(12)	536	6136		
VOLATILE SUSP.	0(0)	1523(15)	0(0)	1359(10)	268	3280		
SLUDGE(ML/L)	0.0(0)	30.2(18)	0.0(0)	19.5(12)	10.0	40.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 1
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 6/10/68 THROUGH 7/28/68 WITH EDITED AVERAGE FROM 7/15/68 TO 7/28/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.4(15)	0.0(0)	22.1(5)	22.0	22.2		
DEPTH(FT)	0.0(0)	24.0(15)	0.0(0)	24.0(5)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	23.8(15)	0.0(0)	23.3(5)	22.2	25.0		
D.O.(MG/L)	2.9(8)	5.2(7)	3.4(3)	6.1(2)	6.0	6.2		
TEMP(DEG C)	37(8)	33(8)	39(3)	35(2)	34	36		
BOD5(MG/L)								
MIXED	204(15)	96(15)	223(7)	104(5)	75	148	53.3	
SETTLED	0(0)	84(7)	0(0)	81(4)	61	101		
SOLIDS(MG/L)								
TOTAL	1019(13)	1062(6)	1051(6)	1142(3)	1068	1184	-8.6	
TOTAL VOLATILE	331(13)	342(6)	365(6)	381(3)	316	414	-4.5	
SUSPENDED	235(14)	273(6)	258(7)	321(3)	248	400	-24.2	
VOLATILE SUSP.	109(13)	115(6)	94(7)	126(3)	98	174	-34.3	
SETT.SOLIDS(ML/L)	0.5(10)	0.6(11)	1.0(4)	0.2(3)	0.1	0.3		
APPARENT COLOR	1265(11)	856(13)	1191(4)	821(4)	740	875	31.0	
PH	7.6(12)	7.2(11)	7.6(7)	7.2(4)	6.9	7.4	5.2	
AMMONIA N(MG/L)	5.7(12)	1.8(12)	7.0(7)	2.6(5)	0.8	5.2	62.4	
PHOSPHATE P(MG/L)	0.8(12)	0.7(12)	0.7(7)	0.5(5)	0.3	1.1	31.3	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
22.3% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
63.7% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 60

TABLE 61

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 1
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO TF2
TEST WAS FROM 6/10/68 THROUGH 7/28/68 WITH EDITED AVERAGE FROM 7/15/68 TO 7/28/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	23.1(8)	0.0(0)	22.1(5)	22.0	22.2		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	2.9(8)	0.0(0)	3.4(3)	0.0(0)				
TEMP(DEG C)	37(8)	35(1)	39(3)	0(0)				
BOD5(MG/L)								
MIXED	204(15)	84(7)	223(7)	81(4)	61	101	63.7	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1019(13)	906(8)	1051(6)	942(5)	814	1054	10.3	
TOTAL VOLATILE	331(13)	263(8)	365(6)	276(5)	233	319	24.4	
SUSPENDED	235(14)	129(8)	258(7)	149(5)	90	193	42.2	
VOLATILE SUSP.	109(13)	67(6)	94(7)	88(3)	57	126	6.5	
SETT.SOLIDS(ML/L)	0.5(10)	0.1(3)	1.0(4)	0.1(2)	0.1	0.1		
APPARENT COLOR	1265(11)	557(6)	1191(4)	658(3)	450	775	44.7	
PH	7.6(12)	7.2(7)	7.6(7)	7.2(4)	7.1	7.4	4.9	
AMMONIA N(MG/L)	5.7(12)	2.2(7)	7.0(7)	1.7(4)	1.1	2.5	74.9	
PHOSPHATE P(MG/L)	0.8(12)	0.4(7)	0.7(7)	0.4(4)	0.2	0.9	43.8	

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 2
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 7/29/68 THROUGH 8/18/68 WITH EDITED AVERAGE FROM 8/12/68 TO 8/18/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.4(8)	0.0(0)	22.2(3)	22.2	22.2		
DEPTH(FT)	0.0(0)	24.0(8)	0.0(0)	24.0(3)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	0.0(8)	0.0(0)	0.0(3)	0.0	0.0		
D.O.(MG/L)	4.0(6)	6.8(3)	4.5(3)	8.5(1)	8.5	8.5		
TEMP(DEG C)	37(6)	33(6)	36(3)	32(2)	30	33		
BOD5(MG/L)								
MIXED	195(8)	159(7)	193(4)	145(2)	124	165	25.0	
SETTLED	0(0)	104(6)	0(0)	97(3)	81	113		
SOLIDS(MG/L)								
TOTAL	1584(7)	1447(7)	1378(3)	1330(2)	1158	1502	3.4	
TOTAL VOLATILE	587(7)	514(7)	527(3)	451(2)	359	544	14.3	
SUSPENDED	389(7)	456(7)	369(3)	414(2)	254	574	-12.1	
VOLATILE SUSP.	147(7)	196(7)	144(3)	183(2)	118	248	-27.1	
SETT.SOLIDS(ML/L)	0.4(7)	5.5(7)	0.1(3)	6.0(2)	4.0	8.0		
APPARENT COLOR	2126(5)	1710(6)	2050(3)	1530(2)	1200	1860	25.3	
PH	8.1(7)	7.5(7)	8.0(3)	7.5(2)	7.5	7.6	6.0	
AMMONIA N(MG/L)	10.1(6)	4.8(7)	5.4(3)	1.8(2)	0.0	3.7	66.1	
PHOSPHATE P(MG/L)	1.8(6)	1.8(7)	1.1(3)	0.5(2)	0.0	1.1	50.0	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
32.8% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
49.6% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 62

TABLE 63

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 2
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO TF2
TEST WAS FROM 7/29/68 THROUGH 8/18/68 WITH EDITED AVERAGE FROM 8/12/68 TO 8/18/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.2(8)	0.0(0)	22.2(3)	22.2	22.2		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	4.0(6)	0.0(0)	4.5(3)	0.0(0)				
TEMP(DEG C)	37(6)	31(5)	36(3)	30(2)	27	33		
BOD5(MG/L)								
MIXED	195(8)	104(6)	193(4)	97(3)	81	113	49.6	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1584(7)	1201(7)	1378(3)	1148(3)	1015	1285	16.7	
TOTAL VOLATILE	587(7)	415(7)	527(3)	386(3)	333	449	26.8	
SUSPENDED	389(7)	271(7)	369(3)	217(3)	174	248	41.1	
VOLATILE SUSP.	147(7)	134(7)	144(3)	104(3)	76	130	27.8	
SETT.SOLIDS(ML/L)	0.4(7)	0.5(6)	0.1(3)	0.6(2)	0.5	0.8		
APPARENT COLOR	2126(5)	1337(6)	2050(3)	1228(3)	1150	1345	40.0	
PH	8.1(7)	7.4(7)	8.0(3)	7.5(3)	7.4	7.8	5.8	
AMMONIA N(MG/L)	10.1(6)	7.0(7)	5.4(3)	4.8(3)	0.6	9.0	12.1	
PHOSPHATE P(MG/L)	1.8(6)	1.5(7)	1.1(3)	0.8(3)	0.0	2.1	27.2	

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 3
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 8/19/68 THROUGH 9/ 8/68 WITH EDITED AVERAGE FROM 8/21/68 TO 8/29/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	44.0(6)	0.0(0)	44.0(4)	43.5	44.4		
DEPTH(FT)	0.0(0)	24.0(6)	0.0(0)	24.0(4)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	0.0(6)	0.0(0)	0.0(4)	0.0	0.0		
D.O.(MG/L)	2.1(6)	2.4(2)	2.4(4)	2.4(2)	1.4	3.5		
TEMP(DEG C)	39(6)	33(1)	39(4)	33(1)	33	33		
BOD5(MG/L)								
MIXED	180(6)	143(6)	194(4)	143(4)	95	187	26.0	
SETTLED	0(0)	122(4)	0(0)	122(4)	55	169		
SOLIDS(MG/L)								
TOTAL	1437(6)	1420(6)	1461(4)	1398(4)	1133	1569	4.3	
TOTAL VOLATILE	581(6)	575(6)	609(4)	540(4)	390	682	11.3	
SUSPENDED	386(6)	384(6)	413(4)	385(4)	322	454	6.8	
VOLATILE SUSP.	163(6)	200(6)	147(4)	202(4)	186	212	-37.6	
SETT.SOLIDS(ML/L)	5.4(6)	2.5(5)	4.5(4)	2.0(3)	0.3	3.0		
APPARENT COLOR	1668(6)	1386(6)	1796(4)	1409(4)	995	1800	21.5	
PH	8.4(6)	7.5(6)	8.4(4)	7.4(4)	7.2	7.8	11.8	
AMMONIA N(MG/L)	3.7(6)	2.5(6)	3.4(4)	1.4(4)	0.0	5.0	58.3	
PHOSPHATE P(MG/L)	3.0(6)	1.9(6)	4.4(4)	2.2(4)	0.3	4.9	48.8	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
15.0% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
37.2% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 64

TABLE 65

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 3
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO TF2
TEST WAS FROM 8/19/68 THROUGH 9/ 8/68 WITH EDITED AVERAGE FROM 8/21/68 TO 8/29/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	44.4(5)	0.0(0)	44.4(4)	44.4	44.4		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	2.1(6)	0.0(0)	2.4(4)	0.0(0)				
TEMP(DEG C)	39(6)	0(0)	39(4)	0(0)				
BOD5(MG/L)								
MIXED	180(6)	122(4)	194(4)	122(4)	55	169	37.2	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1437(6)	1459(4)	1461(4)	1459(4)	970	1781	0.1	
TOTAL VOLATILE	581(6)	547(4)	609(4)	547(4)	341	658	10.0	
SUSPENDED	386(6)	511(4)	413(4)	511(4)	271	896	-23.5	
VOLATILE SUSP.	163(6)	244(4)	147(4)	244(4)	128	424	-66.3	
SETT.SOLIDS(ML/L)	5.4(6)	6.0(4)	4.5(4)	6.0(4)	0.1	14.0		
APPARENT COLOR	1668(6)	1529(4)	1796(4)	1529(4)	1135	1890	14.8	
PH	8.4(6)	7.5(3)	8.4(4)	7.5(3)	7.4	7.7	10.8	
AMMONIA N(MG/L)	3.7(6)	3.5(3)	3.4(4)	3.5(3)	0.5	5.6	-3.1	
PHOSPHATE P(MG/L)	3.0(6)	1.4(3)	4.4(4)	1.4(3)	0.1	2.9	65.9	

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 4
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 9/ 9/68 THROUGH 10/ 6/68 WITH EDITED AVERAGE FROM 9/23/68 TO 10/ 6/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	23.8(10)	0.0(0)	23.3(5)	22.2	28.0		
DEPTH(FT)	0.0(0)	16.0(10)	0.0(0)	16.0(5)	16.0	16.0		
RECYCLE(GPM)	0.0(0)	25.2(10)	0.0(0)	22.1(5)	22.0	22.2		
D.O.(MG/L)	3.6(6)	5.8(4)	4.2(5)	5.7(3)	4.6	6.5		
TEMP(DEG C)	38(6)	32(5)	38(5)	33(3)	32	34		
BOD5(MG/L)								
MIXED	205(9)	120(9)	209(7)	125(5)	99	153	40.2	
SETTLED	0(0)	71(8)	0(0)	89(5)	77	117		
SOLIDS(MG/L)								
TOTAL	1286(9)	1217(10)	1269(7)	1144(5)	1044	1325	9.8	
TOTAL VOLATILE	439(9)	385(10)	431(7)	356(5)	317	428	17.5	
SUSPENDED	432(9)	374(10)	420(7)	330(5)	204	492	21.3	
VOLATILE SUSP.	173(9)	176(10)	172(7)	172(5)	78	222	0.1	
SETT.SOLIDS(ML/L)	1.1(10)	5.2(9)	1.5(7)	5.3(5)	0.3	7.5		
APPARENT COLOR	1617(8)	1180(10)	1555(7)	1104(5)	900	1375	29.0	
PH	8.0(6)	7.4(10)	8.0(6)	7.3(5)	7.3	7.4	8.8	
AMMONIA N(MG/L)	6.6(7)	3.4(9)	6.6(7)	3.3(5)	0.0	7.6	50.4	
PHOSPHATE P(MG/L)	1.8(7)	1.7(9)	1.8(7)	1.4(5)	0.8	2.3	20.9	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
28.6% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
57.3% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 66

TABLE 67

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 5
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 10/ 7/68 THROUGH 10/27/68 WITH EDITED AVERAGE FROM 10/14/68 TO 10/27/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	14.7(9)	0.0(0)	14.7(5)	14.8	14.8		
DEPTH(FT)	0.0(0)	16.0(9)	0.0(0)	16.0(5)	16.0	16.0		
RECYCLE(GPM)	0.0(0)	28.4(9)	0.0(0)	27.5(5)	19.6	29.6		
D.O.(MG/L)	5.5(6)	5.1(6)	5.3(4)	5.0(4)	1.8	6.5		
TEMP(DEG C)	36(5)	32(6)	36(3)	33(4)	31	34		
BOD5(MG/L)								
MIXED	207(9)	115(9)	200(6)	118(5)	88	153	41.1	
SETTLED	0(0)	72(9)	0(0)	74(5)	47	98		
SOLIDS(MG/L)								
TOTAL	1328(8)	1280(8)	1334(5)	1295(4)	1250	1318	2.8	
TOTAL VOLATILE	471(8)	418(8)	464(5)	424(4)	396	462	8.6	
SUSPENDED	399(9)	408(9)	413(6)	390(5)	236	486	5.4	
VOLATILE SUSP.	180(9)	195(9)	179(6)	185(5)	112	232	-3.2	
SETT.SOLIDS(ML/L)	1.1(8)	10.7(9)	1.4(6)	14.2(5)	6.0	40.0		
APPARENT COLOR	1596(7)	1272(9)	1675(5)	1230(5)	750	1500	26.5	
PH	6.8(8)	7.4(8)	7.8(5)	7.4(4)	7.3	7.5	5.6	
AMMONIA N(MG/L)	15.0(9)	3.6(8)	4.4(6)	3.1(4)	1.3	4.2	29.4	
PHOSPHATE P(MG/L)	1.4(9)	1.9(8)	1.1(6)	1.5(4)	1.1	2.4	-36.7	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
37.3% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
63.1% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 6
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 10/28/68 THROUGH 11/17/68 WITH EDITED AVERAGE FROM 11/ 6/68 TO 11/17/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	14.7(8)	0.0(0)	14.7(6)	14.8	14.8		
DEPTH(FT)	0.0(0)	24.0(8)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	29.5(8)	0.0(0)	29.5(6)	29.6	29.6		
D.O.(MG/L)	6.0(6)	4.8(5)	6.3(5)	5.0(4)	4.5	6.1		
TEMP(DEG C)	36(6)	26(4)	36(5)	26(4)	24	28		
BOD5(MG/L)								
MIXED	224(8)	132(8)	216(7)	145(6)	120	172	32.7	
SETTLED	0(0)	81(8)	0(0)	85(6)	70	94		
SOLIDS(MG/L)								
TOTAL	1413(8)	1315(7)	1405(7)	1375(6)	1096	1648	2.1	
TOTAL VOLATILE	579(8)	474(7)	569(7)	504(6)	336	594	11.4	
SUSPENDED	493(8)	447(8)	484(7)	507(6)	246	782	-4.6	
VOLATILE SUSP.	206(8)	217(8)	202(7)	244(6)	52	370	-20.9	
SETT.SOLIDS(ML/L)	1.4(8)	7.6(8)	1.6(7)	9.3(6)	0.4	30.0		
APPARENT COLOR	2219(8)	1600(8)	2182(7)	1738(6)	1400	2300	20.3	
PH	8.4(7)	7.5(8)	8.4(6)	7.5(6)	7.1	8.4	10.4	
AMMONIA N(MG/L)	11.8(8)	6.7(8)	12.7(7)	7.0(6)	2.3	9.7	44.6	
PHOSPHATE P(MG/L)	2.2(8)	1.8(8)	2.2(7)	1.9(6)	1.0	2.8	14.3	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
41.3% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
60.5% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 68

TABLE 69

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 7
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 11/18/68 THROUGH 12/ 6/68 WITH EDITED AVERAGE FROM 11/25/68 TO 12/ 6/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.1(10)	0.0(0)	22.2(5)	22.2	22.2		
DEPTH(FT)	0.0(0)	24.0(10)	0.0(0)	24.0(5)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	22.9(10)	0.0(0)	22.2(5)	22.2	22.2		
D.O.(MG/L)	3.9(7)	5.5(5)	3.3(3)	5.7(3)	5.6	5.9		
TEMP(DEG C)	35(6)	24(5)	35(3)	25(3)	23	27		
BOD5(MG/L)								
MIXED	239(10)	160(10)	229(5)	162(5)	122	188	29.1	
SETTLED	0(0)	82(9)	0(0)	79(4)	30	103		
SOLIDS(MG/L)								
TOTAL	1328(10)	1648(10)	1090(5)	1670(5)	1557	1876	-53.1	
TOTAL VOLATILE	479(10)	563(10)	390(5)	562(5)	466	671	-44.2	
SUSPENDED	439(10)	700(10)	353(5)	696(5)	504	1062	-97.1	
VOLATILE SUSP.	177(10)	312(10)	155(5)	326(5)	234	486	-109.3	
SETT.SOLIDS(ML/L)	1.1(8)	17.9(9)	0.6(4)	23.0(5)	7.0	65.0		
APPARENT COLOR	2203(8)	1868(10)	1788(4)	1860(5)	1550	2400	-4.0	
PH	7.8(10)	7.3(10)	7.5(5)	7.4(5)	7.3	7.5	1.8	
AMMONIA N(MG/L)	8.5(10)	6.5(10)	6.1(5)	4.7(5)	1.9	6.4	22.3	
PHOSPHATE P(MG/L)	1.6(10)	1.9(10)	1.8(5)	1.7(5)	1.0	3.3	3.2	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
51.2% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
65.4% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 8
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 2/ 3/69 THROUGH 3/ 9/69 WITH EDITED AVERAGE FROM 2/26/69 TO 3/ 9/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	33.2(12)	0.0(0)	33.2(6)	33.3	33.3		
DEPTH(FT)	0.0(0)	24.0(12)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	33.2(12)	0.0(0)	33.2(6)	33.3	33.3		
D.O.(MG/L)	6.3(11)	4.1(9)	6.3(6)	3.9(4)	1.0	5.4		
TEMP(DEG C)	31(11)	24(9)	32(6)	26(4)	24	28		
BOD5(MG/L)								
MIXED	285(12)	209(12)	295(6)	178(6)	142	232	39.5	
SETTLED	0(0)	167(12)	0(0)	140(6)	124	175		
SOLIDS(MG/L)								
TOTAL	1887(12)	1818(12)	1855(6)	1704(6)	1566	2080	8.1	
TOTAL VOLATILE	622(12)	575(12)	704(6)	656(6)	451	1140	6.7	
SUSPENDED	462(12)	460(12)	491(6)	438(6)	316	540	10.8	
VOLATILE SUSP.	149(12)	192(12)	203(6)	210(6)	140	290	-3.5	
SETT.SOLIDS(ML/L)	5.7(12)	3.7(12)	4.1(6)	3.6(6)	1.0	7.0		
APPARENT COLOR	2142(12)	1994(12)	2142(6)	1847(6)	1500	2750	13.7	
PH	7.4(11)	7.6(12)	7.5(6)	7.4(6)	7.2	7.8	0.6	
AMMONIA N(MG/L)	6.5(11)	2.6(4)	8.4(6)	3.2(2)	1.4	5.0	61.9	
PHOSPHATE P(MG/L)	2.5(11)	1.7(4)	2.6(6)	2.2(2)	2.0	2.5	14.0	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
21.1% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
52.3% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 70

TABLE 71

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 9
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 3/10/69 THROUGH 4/ 6/69 WITH EDITED AVERAGE FROM 3/17/69 TO 4/ 6/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	44.3(16)	0.0(0)	44.3(12)	44.4	44.4		
DEPTH(FT)	0.0(0)	24.0(16)	0.0(0)	24.0(12)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	22.1(16)	0.0(0)	22.1(12)	22.2	22.2		
D.O.(MG/L)	5.9(13)	5.0(13)	5.7(9)	5.0(10)	3.2	5.8		
TEMP(DEG C)	31(13)	28(13)	31(9)	28(10)	25	30		
BOD5(MG/L)								
MIXED	212(16)	173(16)	207(12)	171(12)	129	207	17.6	
SETTLED	0(0)	131(16)	0(0)	132(12)	89	166		
SOLIDS(MG/L)								
TOTAL	1989(15)	1628(16)	1808(11)	1595(12)	1351	1968	11.8	
TOTAL VOLATILE	644(15)	524(16)	593(11)	514(12)	347	690	13.3	
SUSPENDED	543(15)	424(15)	538(11)	414(11)	178	684	23.1	
VOLATILE SUSP.	242(15)	200(15)	261(11)	195(11)	54	294	25.2	
SETT.SOLIDS(ML/L)	6.8(15)	4.1(16)	7.2(11)	3.8(12)	1.5	7.5		
APPARENT COLOR	1798(15)	1605(16)	1773(11)	1600(12)	1100	2100	9.7	
PH	7.6(11)	7.2(15)	7.7(9)	7.2(12)	6.9	7.9	6.0	
AMMONIA N(MG/L)	7.6(11)	4.1(4)	7.4(9)	4.4(3)	2.4	5.6	40.0	
PHOSPHATE P(MG/L)	2.9(11)	1.8(4)	2.9(9)	2.1(3)	1.7	2.6	29.7	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
22.8% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
36.4% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 10
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF.

TEST WAS FROM 4/14/69 THROUGH 5/ 4/69 WITH EDITED AVERAGE FROM 4/21/69 TO 5/ 4/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	29.5(8)	0.0(0)	29.5(6)	29.6	29.6		
DEPTH(FT)	0.0(0)	24.0(8)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	14.7(8)	0.0(0)	14.7(6)	14.8	14.8		
D.O.(MG/L)	5.4(6)	4.3(6)	5.3(5)	3.7(5)	0.0	5.0		
TEMP(DEG C)	32(6)	29(5)	33(5)	29(5)	28	30		
BOD5(MG/L)								
MIXED	245(8)	164(8)	212(6)	146(6)	105	183	31.1	
SETTLED	0(0)	138(8)	0(0)	121(6)	90	168		
SOLIDS(MG/L)								
TOTAL	1525(8)	1449(8)	1471(6)	1399(6)	1240	1640	4.8	
TOTAL VOLATILE	574(8)	514(8)	548(6)	492(6)	343	700	10.2	
SUSPENDED	284(7)	237(7)	294(6)	242(5)	82	468	17.5	
VOLATILE SUSP.	166(7)	144(6)	168(6)	144(5)	44	278	14.0	
SETT.SOLIDS(ML/L)	0.8(8)	4.9(8)	1.0(6)	5.0(6)	0.0	15.0		
APPARENT COLOR	1644(8)	1438(8)	1508(6)	1325(6)	900	1700	12.1	
PH	7.7(7)	7.4(8)	7.6(5)	7.3(6)	7.2	7.4	4.7	
AMMONIA N(MG/L)	8.1(7)	6.2(2)	9.6(5)	6.2(2)	6.0	6.5	34.8	
PHOSPHATE P(MG/L)	2.8(7)	2.3(2)	2.9(5)	2.3(2)	1.7	3.0	21.6	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
17.2% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
43.0% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 72

TABLE 73

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 11
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF1
TEST WAS FROM 5/ 5/69 THROUGH 5/25/69 WITH EDITED AVERAGE FROM 5/14/69 TO 5/25/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	22.1(12)	22.1(12)	22.2(4)	22.2(6)	22.2	22.2		
DEPTH(FT)	24.0(12)	24.0(12)	24.0(4)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	22.1(12)	22.1(12)	22.2(4)	22.2(6)	22.2	22.2		
D.O.(MG/L)	0.0(0)	7.2(12)	0.0(0)	7.4(6)	7.4	7.6		
TEMP(DEG C)	26(12)	24(12)	26(4)	25(6)	23	28		
BOD5(MG/L)								
MIXED	64(11)	143(11)	62(3)	215(5)	138	314	-246.7	-8.8
SETTLED	0(0)	46(11)	0(0)	58(5)	51	67		
SOLIDS(MG/L)								
TOTAL	1310(12)	1326(12)	1315(4)	1419(6)	1330	1562	-7.8	9.1
TOTAL VOLATILE	363(12)	388(12)	382(4)	420(6)	380	492	-9.6	20.6
SUSPENDED	247(12)	285(12)	265(4)	336(6)	244	422	-27.1	15.3
VOLATILE SUSP.	110(12)	164(12)	135(4)	173(6)	142	210	-27.4	3.7
SETT.SOLIDS(ML/L)	1.7(12)	3.6(12)	1.6(4)	3.6(6)	2.5	5.0		
APPARENT COLOR	1142(12)	1102(12)	1163(4)	1200(6)	1050	1300	-3.2	35.0
PH	7.3(12)	7.5(12)	7.3(4)	7.4(6)	7.4	7.7	-1.4	-2.5
AMMONIA N(MG/L)	9.1(3)	3.9(3)	7.6(1)	4.0(2)	2.2	5.9	46.7	65.4
PHOSPHATE P(MG/L)	1.6(3)	1.7(3)	1.6(1)	1.8(2)	1.5	2.2	-15.6	38.6

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
73.1% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
6.7% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT
70.7% REMOVAL OF PF TO SETTLED EFFLUENT
( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 12
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 5/26/69 THROUGH 6/15/69 WITH EDITED AVERAGE FROM 6/ 2/69 TO 6/15/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	33.2(10)	0.0(0)	33.2(8)	33.3	33.3		
DEPTH(FT)	0.0(0)	24.0(10)	0.0(0)	24.0(8)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	33.2(10)	0.0(0)	33.2(8)	33.3	33.3		
D.O.(MG/L)	3.2(8)	5.3(8)	3.5(4)	5.3(6)	4.0	6.7		
TEMP(DEG C)	36(8)	33(8)	37(4)	33(6)	31	35		
BOD5(MG/L)								
MIXED	167(10)	135(10)	194(6)	133(8)	74	170	31.5	
SETTLED	0(0)	99(10)	0(0)	98(8)	60	142		
SOLIDS(MG/L)								
TOTAL	1537(9)	1495(9)	1607(6)	1512(7)	1372	1669	5.8	
TOTAL VOLATILE	548(9)	482(9)	565(6)	487(7)	417	542	13.7	
SUSPENDED	404(9)	409(9)	487(6)	421(7)	322	590	13.4	
VOLATILE SUSP.	152(9)	180(9)	169(6)	176(7)	116	236	-4.3	
SETT.SOLIDS(ML/L)	2.0(10)	5.2(10)	2.3(6)	5.0(8)	4.0	7.0		
APPARENT COLOR	1643(10)	1437(10)	1813(6)	1528(8)	1250	2020	15.7	
PH	7.0(8)	7.4(10)	7.0(5)	7.5(8)	7.2	8.8	-6.7	
AMMONIA N(MG/L)	7.5(8)	5.8(3)	7.0(5)	5.3(2)	3.9	6.8	23.7	
PHOSPHATE P(MG/L)	3.4(8)	3.1(3)	3.8(5)	3.2(2)	3.2	3.2	17.5	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
26.2% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
49.5% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 74

TABLE 75

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 13
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 6/16/69 THROUGH 7/ 3/69 WITH EDITED AVERAGE FROM 6/23/69 TO 7/ 3/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	22.1(11)	0.0(0)	22.2(6)	22.2	22.2		
DEPTH(FT)	0.0(0)	24.0(11)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	22.1(11)	0.0(0)	22.2(6)	22.2	22.2		
D.O.(MG/L)	5.8(10)	6.3(10)	5.8(6)	6.4(5)	5.4	7.5		
TEMP(DEG C)	37(10)	34(10)	38(6)	35(5)	33	37		
BOD5(MG/L)								
MIXED	232(11)	147(11)	240(7)	169(6)	102	226	29.4	
SETTLED	0(0)	153(11)	0(0)	141(6)	98	180		
SOLIDS(MG/L)								
TOTAL	1491(10)	1889(10)	1506(6)	2287(5)	1479	5230	-51.8	
TOTAL VOLATILE	524(10)	520(9)	522(6)	536(4)	469	609	-2.8	
SUSPENDED	381(10)	398(10)	344(6)	380(5)	120	778	-10.5	
VOLATILE SUSP.	171(10)	201(9)	137(6)	175(4)	72	282	-28.0	
SETT.SOLIDS(ML/L)	3.1(10)	5.1(11)	0.9(6)	4.0(6)	2.0	8.0		
APPARENT COLOR	1800(10)	1691(11)	1983(6)	1825(6)	1300	2500	7.9	
PH	7.8(7)	7.8(11)	7.4(4)	7.5(6)	7.2	8.2	-2.7	
AMMONIA N(MG/L)	17.6(7)	14.1(6)	17.0(4)	14.9(3)	9.8	21.4	12.0	
PHOSPHATE P(MG/L)	5.1(7)	3.4(6)	5.4(4)	3.3(3)	2.1	4.9	37.9	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
16.9% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
41.4% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 14
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF1
TEST WAS FROM 7/14/69 THROUGH 8/31/69 WITH EDITED AVERAGE FROM 8/20/69 TO 8/31/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	22.1(16)	22.1(16)	22.2(6)	22.2(6)	22.2	22.2		
DEPTH(FT)	24.0(16)	24.0(16)	24.0(6)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	22.1(16)	22.1(16)	22.2(6)	22.2(6)	22.2	22.2		
D.O.(MG/L)	0.0(0)	6.4(14)	0.0(0)	6.4(6)	5.6	8.3		
TEMP(DEG C)	32(15)	29(14)	32(6)	28(6)	27	29		
BOD5(MG/L)								
MIXED	108(17)	74(17)	99(6)	52(6)	44	72	47.3	73.9
SETTLED	0(0)	49(17)	0(0)	31(6)	26	34		
SOLIDS(MG/L)								
TOTAL	1146(16)	1158(15)	1186(6)	1192(6)	1025	1386	-0.5	5.9
TOTAL VOLATILE	422(14)	384(15)	403(6)	377(6)	312	486	6.3	23.0
SUSPENDED	891(17)	310(15)	1009(6)	379(6)	214	638	62.4	14.3
VOLATILE SUSP.	269(14)	170(13)	469(4)	190(6)	92	336	59.4	19.0
SETT.SOLIDS(ML/L)	1.4(14)	3.1(15)	2.1(4)	4.9(5)	3.0	9.0		
APPARENT COLOR	2331(16)	1144(16)	1150(6)	992(6)	600	1250	13.7	33.8
PH	7.6(15)	7.6(15)	7.6(6)	7.6(6)	7.5	7.8	-0.4	3.1
AMMONIA N(MG/L)	7.1(6)	3.8(4)	0.7(2)	1.5(2)	0.6	2.4	-100.0	54.0
PHOSPHATE P(MG/L)	5.1(6)	3.7(4)	2.3(2)	2.4(2)	2.1	2.8	-4.2	-2.0

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
41.5% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
69.1% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT
84.7% REMOVAL OF PF TO SETTLED EFFLUENT
( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 76

TABLE 77

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 15
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS CL2
TEST WAS FROM 9/ 1/69 THROUGH 10/12/69 WITH EDITED AVERAGE FROM 10/ 1/69 TO 10/12/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	66.6(16)	66.6(16)	66.6(6)	66.6(6)	66.7	66.7		
DEPTH(FT)	0.0(0)	24.0(16)	0.0(0)	24.0(6)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	0.0(16)	0.0(0)	0.0(6)	0.0	0.0		
D.O.(MG/L)	0.0(0)	6.7(14)	0.0(0)	6.4(5)	3.5	7.7		
TEMP(DEG C)	0(0)	26(14)	0(0)	25(5)	23	27		
BOD5(MG/L)								
MIXED	26(16)	42(16)	18(6)	25(6)	20	40	-34.5	85.3
SETTLED	0(0)	25(16)	0(0)	16(6)	12	29		
SOLIDS(MG/L)								
TOTAL	1011(16)	1020(16)	988(6)	1044(6)	896	1207	-5.7	9.7
TOTAL VOLATILE	322(16)	333(16)	348(6)	347(6)	274	423	0.1	28.1
SUSPENDED	137(16)	134(16)	85(6)	113(6)	82	138	-32.5	61.8
VOLATILE SUSP.	107(6)	121(5)	86(1)	72(2)	50	94	16.0	63.0
SETT.SOLIDS(ML/L)	0.6(16)	1.0(16)	0.1(6)	1.2(6)	0.2	2.0		
APPARENT COLOR	464(16)	497(16)	339(6)	413(6)	280	650	-21.8	48.3
PH	7.5(16)	7.7(16)	7.4(6)	7.5(6)	7.1	7.8	-1.5	8.3
AMMONIA N(MG/L)	1.7(4)	0.6(4)	0.4(2)	0.5(2)	0.0	1.0	-25.0	95.2
PHOSPHATE P(MG/L)	0.7(4)	1.0(4)	1.0(2)	1.4(2)	0.6	2.2	-33.3	47.5

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
34.4% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
11.8% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT
90.4% REMOVAL OF PF TO SETTLED EFFLUENT
( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 16
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 10/13/69 THROUGH 12/19/69 WITH EDITED AVERAGE FROM 12/ 1/69 TO 12/19/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	66.6(27)	0.0(0)	66.6(11)	66.7	66.7		
DEPTH(FT)	0.0(0)	24.0(27)	0.0(0)	24.0(11)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	0.0(27)	0.0(0)	0.0(11)	0.0	0.0		
D.O.(MG/L)	5.1(25)	5.8(24)	5.1(10)	6.1(10)	5.4	6.8		
TEMP(DEG C)	32(25)	29(24)	31(10)	28(10)	26	30		
BOD5(MG/L)								
MIXED	291(27)	253(27)	291(11)	244(11)	159	489	16.1	
SETTLED	0(0)	207(27)	0(0)	181(11)	144	236		
SOLIDS(MG/L)								
TOTAL	2289(27)	1967(27)	1802(11)	1947(11)	1410	3098	-8.0	
TOTAL VOLATILE	1169(27)	851(27)	654(11)	750(11)	403	1532	-14.7	
SUSPENDED	444(27)	988(27)	326(11)	873(11)	174	2344	-167.8	
VOLATILE SUSP.	188(23)	303(23)	169(9)	286(9)	60	810	-68.5	
SETT.SOLIDS(ML/L)	3.7(27)	7.9(27)	2.1(11)	8.9(11)	2.5	26.0		
APPARENT COLOR	1805(27)	1793(26)	1635(11)	1667(11)	1120	2480	-2.0	
PH	7.5(27)	7.3(27)	7.3(11)	7.5(11)	6.9	8.6	-2.2	
AMMONIA N(MG/L)	13.5(19)	12.3(7)	14.4(9)	14.9(3)	6.6	30.4	-3.1	
PHOSPHATE P(MG/L)	3.2(18)	3.6(7)	3.8(8)	5.2(3)	3.9	7.6	-35.4	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
25.8% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
37.7% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 78

TABLE 79

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 17
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 1/ 5/70 THROUGH 3/ 8/70 WITH EDITED AVERAGE FROM 2/12/70 TO 3/ 8/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	66.6(20)	0.0(0)	66.6(8)	66.7	66.7		
DEPTH(FT)	0.0(0)	24.0(20)	0.0(0)	24.0(8)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	0.0(20)	0.0(0)	0.0(8)	0.0	0.0		
D.O.(MG/L)	2.6(14)	7.2(15)	1.3(6)	8.4(7)	3.5	10.0		
TEMP(DEG C)	30(14)	25(15)	29(6)	24(7)	20	28		
BOD5(MG/L)								
MIXED	472(20)	389(20)	531(9)	491(8)	161	961	7.6	
SETTLED	0(0)	389(20)	0(0)	462(8)	170	961		
SOLIDS(MG/L)								
TOTAL	2686(20)	2435(20)	2811(9)	2843(8)	1713	4634	-1.1	
TOTAL VOLATILE	1211(20)	1050(20)	1351(9)	1365(8)	557	2545	-0.9	
SUSPENDED	714(20)	616(20)	788(9)	747(8)	438	1322	5.2	
VOLATILE SUSP.	389(20)	331(20)	428(9)	420(8)	208	770	1.8	
SETT.SOLIDS(ML/L)	0.6(20)	1.7(20)	0.7(9)	2.7(8)	0.3	9.0		
APPAREN COLOR	4410(20)	3643(20)	4732(9)	4603(8)	1920	8500	2.7	
PH	8.9(20)	8.6(20)	8.8(9)	8.6(8)	7.9	9.7	1.5	
AMMONIA N(MG/L)	24.0(19)	24.3(6)	14.8(8)	15.4(2)	12.8	18.1	-4.3	
PHOSPHATE P(MG/L)	6.3(16)	6.7(6)	6.8(9)	6.2(2)	6.0	6.5	8.8	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
5.8% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
13.0% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST TF2 18
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 3/ 9/70 THROUGH 5/ 1/70 WITH EDITED AVERAGE FROM 4/13/70 TO 5/ 1/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	33.2(22)	0.0(0)	33.2(11)	33.3	33.3		
DEPTH(FT)	0.0(0)	24.0(22)	0.0(0)	24.0(11)	24.0	24.0		
RECYCLE(GPM)	0.0(0)	33.2(22)	0.0(0)	33.2(11)	33.3	33.3		
D.O.(MG/L)	1.3(16)	4.9(16)	1.0(10)	4.6(9)	3.2	5.2		
TEMP(DEG C)	32(16)	30(16)	34(10)	31(9)	27	36		
BOD5(MG/L)								
MIXED	594(22)	393(22)	634(12)	417(11)	304	704	34.2	
SETTLED	0(0)	377(22)	0(0)	366(11)	259	449		
SOLIDS(MG/L)								
TOTAL	2599(22)	2660(22)	2632(12)	2560(11)	2155	2840	2.7	
TOTAL VOLATILE	1216(22)	1130(22)	1266(12)	1147(11)	950	1360	9.3	
SUSPENDED	580(21)	604(21)	507(11)	595(11)	296	932	-17.4	
VOLATILE SUSP.	341(21)	380(21)	324(11)	399(11)	168	752	-23.3	
SETT.SOLIDS(ML/L)	0.5(22)	2.1(22)	0.7(12)	2.5(11)	0.5	7.2		
APPARENT COLOR	4509(22)	3921(22)	4607(12)	3765(11)	2780	4600	18.2	
PH	9.2(22)	8.6(22)	9.1(12)	8.4(11)	8.0	8.7	7.6	
AMMONIA N(MG/L)	23.9(18)	18.4(6)	13.3(8)	18.0(2)	17.9	18.1	-34.4	
PHOSPHATE P(MG/L)	10.2(18)	7.2(6)	8.8(8)	7.8(2)	6.0	9.6	11.7	

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
12.1% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
42.1% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 80

TABLE 81

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 1
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 6/17/68 THROUGH 7/28/68 WITH EDITED AVERAGE FROM 7/ 3/68 TO 7/28/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	41.4(15)	0.0(0)	41.6(10)	40.6	43.5		
DEPTH(FT)	0.0(0)	6.7(15)	0.0(0)	6.7(10)	6.7	6.7		
RECYCLE(GPM)	0.0(0)	0.0(14)	0.0(0)	0.0(9)				
D.O.(MG/L)	2.9(8)	3.4(4)	2.7(5)	3.4(2)	2.5	4.3		
TEMP(DEG C)	37(8)	28(10)	37(5)	30(5)	27	31		
BOD5(MG/L)								
MIXED	204(15)	65(15)	220(10)	67(10)	29	135	69.7	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1019(13)	1050(6)	1072(9)	1050(6)	913	1303	2.0	
TOTAL VOLATILE	331(13)	311(6)	363(9)	311(6)	249	361	14.2	
SUSPENDED	235(14)	248(6)	239(10)	248(6)	96	440	-3.7	
VOLATILE SUSP.	109(13)	124(5)	110(10)	124(5)	50	184	-12.9	
SETT.SOLIDS(ML/L)	0.5(10)	4.6(5)	0.8(6)	5.7(4)	0.2	14.0		
APPARENT COLOR	1265(11)	108?(13)	1309(7)	1113(9)	550	2250	14.9	
PH	7.6(12)	7.4(11)	7.6(10)	7.4(9)	7.3	7.9	2.6	
AMMONIA N(MG/L)	5.7(12)	1.4(12)	6.0(10)	1.5(10)	0.4	3.6	73.8	
PHOSPHATE P(MG/L)	0.8(12)	1.1(12)	0.8(10)	0.9(10)	0.3	2.0	-13.0	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	3.2(10)	0.0(0)	2.7(5)	1.9	4.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 2
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 7/29/68 THROUGH 9/ 8/68 WITH EDITED AVERAGE FROM 8/21/68 TO 9/ 8/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	60.5(14)	0.0(0)	59.7(5)	58.0	60.8		
DEPTH(FT)	0.0(0)	6.7(14)	0.0(0)	6.7(5)	6.7	6.7		
RECYCLE(GPM)	0.0(0)	0.0(14)	0.0(0)	0.0(5)				
D.O.(MG/L)	3.1(12)	2.1(12)	2.6(5)	2.0(5)	1.0	3.8		
TEMP(DEG C)	38(12)	30(13)	38(5)	30(5)	25	32		
BOD5(MG/L)								
MIXED	189(14)	111(12)	190(5)	75(4)	44	104	60.3	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1516(13)	1488(12)	1418(5)	1602(4)	1407	1873	-12.9	
TOTAL VOLATILE	584(13)	556(12)	585(5)	689(4)	541	793	-17.6	
SUSPENDED	388(13)	614(12)	390(5)	591(4)	265	906	-51.5	
VOLATILE SUSP.	154(13)	303(12)	151(5)	314(4)	132	466	-107.9	
SETT.SOLIDS(ML/L)	2.7(13)	20.6(10)	6.2(5)	14.7(4)	2.0	30.0		
APPARENT COLOR	1876(11)	1782(11)	1667(5)	1721(4)	1000	2490	-3.2	
PH	8.2(13)	7.6(12)	8.4(5)	7.6(4)	7.5	7.8	9.5	
AMMONIA N(MG/L)	6.9(12)	2.0(12)	2.7(5)	1.4(4)	0.1	2.8	49.1	
PHOSPHATE P(MG/L)	2.4(12)	1.9(12)	3.6(5)	1.6(4)	0.7	2.8	54.2	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	1.8(13)	0.0(0)	1.6(5)	0.4	3.5		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 82

TABLE 83

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 3
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 9/ 9/68 THROUGH 10/20/68 WITH EDITED AVERAGE FROM 10/11/68 TO 10/20/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	30.2(17)	0.0(0)	30.2(5)	30.3	30.3		
DEPTH(FT)	0.0(0)	6.7(17)	0.0(0)	6.7(5)	6.7	6.7		
RECYCLE(GPM)	0.0(0)	0.0(17)	0.0(0)	0.0(5)				
D.O.(MG/L)	4.6(11)	6.0(15)	5.4(4)	5.3(5)	4.2	6.4		
TEMP(DEG C)	37(10)	22(14)	36(3)	23(5)	19	25		
BOD5(MG/L)								
MIXED	205(15)	94(16)	187(4)	105(5)	88	148	43.9	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1305(14)	1335(16)	1318(3)	1371(4)	1275	1490	-3.9	
TOTAL VOLATILE	454(14)	439(16)	458(3)	464(4)	398	524	-1.2	
SUSPENDED	423(15)	571(14)	432(4)	503(4)	378	640	-16.5	
VOLATILE SUSP.	174(15)	316(14)	179(4)	254(4)	228	302	-42.1	
SETT.SOLIDS(ML/L)	1.1(15)	28.5(17)	1.5(4)	35.6(5)	21.0	54.0		
APPARENT COLOR	1624(12)	1296(16)	1783(3)	1516(5)	1175	1880	14.9	
PH	7.1(11)	7.6(16)	7.5(3)	7.7(5)	7.6	7.9	-2.0	
AMMONIA N(MG/L)	13.2(13)	0.8(17)	4.1(4)	1.1(5)	0.2	1.6	72.6	
PHOSPHATE P(MG/L)	1.7(13)	2.4(17)	0.9(4)	2.1(5)	1.2	3.6	-119.9	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	5.8(15)	0.0(0)	5.0(5)	3.8	6.4		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 4
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 10/21/68 THROUGH 12/ 6/68 WITH EDITED AVERAGE FROM 11/25/68 TO 12/ 6/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	40.6(20)	0.0(0)	41.0(5)	41.0	41.0		
DEPTH(FT)	0.0(0)	6.7(20)	0.0(0)	6.7(5)	6.7	6.7		
RECYCLE(GPM)	0.0(0)	0.0(20)	0.0(0)	0.0(5)				
D.O.(MG/L)	4.9(14)	6.5(19)	3.3(3)	7.0(5)	6.6	7.5		
TEMP(DEG C)	35(13)	17(19)	35(3)	16(5)	13	17		
BOD5(MG/L)								
MIXED	230(21)	153(21)	229(5)	149(6)	131	167	34.7	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1357(21)	1517(21)	1090(5)	1649(6)	1572	1736	-51.2	
TOTAL VOLATILE	514(21)	544(21)	390(5)	558(6)	512	623	-43.2	
SUSPENDED	451(21)	646(21)	353(5)	688(6)	604	786	-95.0	
VOLATILE SUSP.	189(21)	316(21)	155(5)	334(6)	240	410	-114.8	
SETT.SOLIDS(ML/L)	1.2(19)	34.5(18)	0.6(4)	56.0(3)	50.0	60.0		
APPARENT COLOR	2105(19)	1522(20)	1788(4)	1750(5)	1550	1850	2.0	
PH	8.1(20)	7.4(20)	7.5(5)	7.3(6)	7.3	7.5	2.1	
AMMONIA N(MG/L)	9.0(21)	1.7(20)	6.1(5)	0.9(6)	0.0	2.0	84.6	
PHOSPHATE P(MG/L)	1.8(21)	1.8(20)	1.8(5)	1.7(6)	1.1	3.0	3.0	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	6.5(19)	0.0(0)	7.3(5)	6.8	7.7		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 84

TABLE 85

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 5
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 2/ 3/69 THROUGH 3/30/69 WITH EDITED AVERAGE FROM 3/10/69 TO 3/30/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	24.3(16)	0.0(0)	24.3(9)	24.4	24.4		
DEPTH(FT)	0.0(0)	6.7(16)	0.0(0)	6.7(9)	6.7	6.7		
RECYCLE(GPM)	0.0(0)	0.0(16)	0.0(0)	0.0(9)				
D.O.(MG/L)	6.1(21)	6.5(15)	5.8(9)	6.4(8)	4.8	8.7		
TEMP(DEG C)	31(21)	14(15)	31(9)	14(8)	12	16		
BOD5(MG/L)								
MIXED	249(24)	57(17)	220(11)	50(9)	37	73	77.3	
SETTLED	0(0)	42(16)	0(0)	39(9)	33	51		
SOLIDS(MG/L)								
TOTAL	1993(23)	1402(16)	1883(10)	1393(9)	1283	1447	26.0	
TOTAL VOLATILE	647(23)	413(16)	560(10)	390(9)	325	451	30.3	
SUSPENDED	485(23)	208(15)	514(10)	201(8)	106	268	60.8	
VOLATILE SUSP.	161(23)	112(15)	183(10)	108(8)	26	174	41.1	
SETT.SOLIDS(ML/L)	7.2(23)	0.4(16)	8.3(10)	0.3(9)	0.1	1.0		
APPARENT COLOR	2040(23)	1058(16)	1993(10)	1019(9)	800	1200	48.8	
PH	7.5(18)	6.9(15)	7.6(7)	7.4(8)	7.1	7.8	2.3	
AMMONIA N(MG/L)	7.0(18)	3.9(6)	7.7(7)	6.3(3)	3.4	9.5	18.2	
PHOSPHATE P(MG/L)	2.8(18)	1.0(6)	3.3(7)	1.1(3)	0.8	1.6	65.6	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	6.2(15)	0.0(0)	5.9(8)	4.5	7.0		

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
22.0% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
82.3% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 6
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 3/31/69 THROUGH 5/ 4/69 WITH EDITED AVERAGE FROM 4/23/69 TO 5/ 4/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	30.3(13)	0.0(0)	30.3(5)	30.4	30.4		
DEPTH(FT)	0.0(0)	6.7(13)	0.0(0)	6.7(5)	6.7	6.7		
RECYCLE(GPM)	0.0(0)	0.0(13)	0.0(0)	0.0(5)				
D.O.(MG/L)	5.4(10)	4.4(11)	5.1(4)	3.6(5)	2.5	5.7		
TEMP(DEG C)	32(10)	19(11)	33(4)	21(5)	19	22		
BOD5(MG/L)								
MIXED	229(13)	75(13)	213(5)	79(5)	72	86	62.9	
SETTLED	0(0)	39(13)	0(0)	38(5)	30	46		
SOLIDS(MG/L)								
TOTAL	1570(13)	1509(13)	1466(5)	1502(5)	1354	1707	-2.4	
TOTAL VOLATILE	571(13)	495(13)	564(5)	512(5)	481	603	9.2	
SUSPENDED	406(12)	371(13)	299(5)	339(5)	46	602	-13.4	
VOLATILE SUSP.	251(12)	211(13)	169(5)	224(5)	6	368	-33.0	
SETT.SOLIDS(ML/L)	0.8(13)	9.9(13)	1.2(5)	13.9(5)	6.5	26.0		
APPARENT COLOR	1581(13)	1252(13)	1500(5)	1250(5)	950	1600	16.6	
PH	7.7(12)	7.4(13)	7.7(4)	7.4(5)	7.4	7.6	3.1	
AMMONIA N(MG/L)	8.1(12)	4.5(3)	9.7(4)	5.0(2)	3.7	6.4	48.2	
PHOSPHATE P(MG/L)	2.7(12)	2.2(3)	3.0(4)	2.4(2)	2.1	2.8	20.3	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	4.5(11)	0.0(0)	3.7(5)	2.4	6.0		

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
51.3% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
81.9% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 86

TABLE 87

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 7
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 5/ 5/69 THROUGH 5/25/69 WITH EDITED AVERAGE FROM 5/ 5/69 TO 5/25/69

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	40.5(12)	0.0(0)	40.5(11)	40.6	40.6		
DEPTH(FT)	0.0(0)	6.7(12)	0.0(0)	6.7(11)	6.7	6.7		
RECYCLE(GPM)	0.0(0)	0.0(12)	0.0(0)	0.0(11)				
D.O.(MG/L)	6.5(11)	2.0(12)	6.5(11)	2.0(11)	0.7	3.0		
TEMP(DEG C)	32(11)	24(12)	32(11)	24(11)	20	26		
BOD5(MG/L)								
MIXED	206(11)	107(10)	206(11)	113(9)	83	160	44.9	
SETTLED	0(0)	46(11)	0(0)	49(10)	31	74		
SOLIDS(MG/L)								
TOTAL	1503(12)	1523(12)	1503(12)	1537(11)	1246	1917	-2.2	
TOTAL VOLATILE	500(12)	463(12)	500(12)	467(11)	320	620	6.6	
SUSPENDED	329(12)	530(10)	329(12)	544(9)	242	700	-65.3	
VOLATILE SUSP.	152(12)	261(10)	152(12)	268(9)	150	344	-76.4	
SETT.SOLIDS(ML/L)	0.7(12)	30.7(12)	0.7(12)	31.9(11)	2.5	54.0		
APPARENT COLOR	1628(12)	1438(12)	1628(12)	1445(11)	700	2300	11.1	
PH	7.3(12)	7.4(12)	7.3(12)	7.4(11)	7.4	7.6	-2.1	
AMMONIA N(MG/L)	12.4(12)	6.5(3)	12.4(12)	6.5(3)	0.8	12.3	46.9	
PHOSPHATE P(MG/L)	3.2(12)	2.4(3)	3.2(12)	2.4(3)	2.0	2.8	25.7	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	1.7(12)	0.0(0)	1.7(11)	0.5	3.2		

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
56.6% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
76.1% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 8
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS CL2

TEST WAS FROM 5/26/69 THROUGH 6/27/69 WITH EDITED AVERAGE FROM 6/23/69 TO 6/27/69

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	80.6(18)	80.0(18)	81.0(2)	80.0(3)	80.0	80.0		
DEPTH(FT)	0.0(0)	7.6(18)	0.0(0)	7.7(3)	7.7	7.7		
RECYCLE(GPM)	0.0(0)	0.0(16)	0.0(0)	0.0(2)				
D.O.(MG/L)	0.0(0)	6.9(17)	0.0(0)	7.3(3)	7.1	7.5		
TEMP(DEG C)	0(0)	24(17)	0(0)	26(3)	22	29		
BOD5(MG/L)								
MIXED	36(17)	126(18)	22(2)	81(3)	34	144-278.2		64.2
SETTLED	0(0)	45(18)	0(0)	32(3)	27	38		
SOLIDS(MG/L)								
TOTAL	1146(17)	1352(17)	1122(2)	1149(3)	1096	1252	-2.4	20.3
TOTAL VOLATILE	310(17)	394(17)	263(2)	286(3)	239	327	-8.5	44.5
SUSPENDED	133(17)	334(17)	34(2)	182(3)	46	264-436.9		47.7
VOLATILE SUSP.	76(14)	154(16)	24(1)	114(2)	72	156-378.1		9.7
SETT.SOLIDS(ML/L)	2.3(17)	5.8(18)	1.5(2)	1.0(3)	0.5	1.5		
APPARENT COLOR	1465(17)	916(18)	3675(2)	667(3)	600	700	81.8	67.6
PH	7.7(18)	7.8(18)	7.7(2)	7.9(3)	7.9	8.0	-3.4	0.4
AMMONIA N(MG/L)	1.8(2)	1.5(3)	0.0(0)	0.0(0)				
PHOSPHATE P(MG/L)	1.6(2)	2.2(3)	0.0(0)	0.0(0)				
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	6.6(17)	0.0(0)	7.1(3)	6.9	7.7		
SOLIDS(MG/L)								
SUSPENDED	5491(16)	0(0)	11298(2)	0(0)				
VOLATILE SUSP.	2588(16)	0(0)	5253(2)	0(0)				
SLUDGE(ML/L)	500.0(16)	0.0(0)	955.0(2)	0.0(0)				

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
61.0% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
-47.2% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT
86.0% REMOVAL OF PF TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 88

TABLE 89

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 9
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS CL2

TEST WAS FROM 6/30/69 THROUGH 8/31/69 WITH EDITED AVERAGE FROM 8/18/69 TO 8/31/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	40.5(14)	40.0(14)	40.5(2)	40.0(3)	40.0	40.0		
DEPTH(FT)	0.0(0)	5.5(14)	0.0(0)	5.5(3)	5.5	5.5		
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	0.0(0)	7.1(13)	0.0(0)	7.4(3)	6.4	8.2		
TEMP(DEG C)	0(0)	25(13)	0(0)	25(3)	22	29		
BOD5(MG/L)								
MIXED	21(17)	31(17)	9(2)	23(3)	18	33	-170.5	88.7
SETTLED	0(0)	16(17)	0(0)	13(3)	10	15		
SOLIDS(MG/L)								
TOTAL	945(14)	1008(14)	813(2)	930(3)	887	1009	-14.3	26.0
TOTAL VOLATILE	285(14)	287(14)	216(2)	261(3)	218	295	-20.9	45.4
SUSPENDED	141(13)	209(13)	93(2)	148(3)	108	180	-59.1	64.3
VOLATILE SUSP.	89(9)	108(12)	60(1)	100(3)	60	140	-68.0	54.2
SETT.SOLIDS(ML/L)	0.3(12)	3.0(12)	0.2(1)	2.2(2)	1.5	3.0		
APPARENT COLOR	591(13)	582(13)	265(2)	427(3)	280	700	-61.0	70.9
PH	7.7(13)	7.8(13)	7.9(2)	8.0(3)	7.9	8.1	-1.6	-2.4
AMMONIA N(MG/L)	0.3(3)	5.0(3)	0.1(1)	0.0(0)				
PHOSPHATE P(MG/L)	2.3(3)	2.2(2)	1.9(1)	0.0(0)				
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	7.2(13)	0.0(0)	7.4(3)	6.5	8.4		
SOLIDS(MG/L)								
SUSPENDED	9475(14)	0(0)	7274(2)	0(0)				
VOLATILE SUSP.	4607(14)	0(0)	2962(2)	0(0)				
SLUDGE(ML/L)	580.0(13)	0.0(0)	612.5(2)	0.0(0)				

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
42.0% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
-56.8% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT
93.4% REMOVAL OF PF TO SETTLED EFFLUENT
( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 10
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 9/ 1/69 THROUGH 10/12/69 WITH EDITED AVERAGE FROM 9/15/69 TO 10/ 3/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	32.0(16)	0.0(0)	32.0(12)	32.0	32.0		
DEPTH(FT)	0.0(0)	7.7(16)	0.0(0)	7.7(12)	7.7	7.7		
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	5.5(14)	3.6(15)	5.5(11)	3.1(11)	2.0	4.5		
TEMP(DEG C)	35(14)	23(15)	36(11)	23(11)	21	25		
BOD5(MG/L)								
MIXED	198(16)	131(16)	222(12)	142(12)	36	302	35.9	
SETTLED	0(0)	38(16)	0(0)	35(12)	16	91		
SOLIDS(MG/L)								
TOTAL	1259(16)	1626(16)	1357(12)	1774(12)	1035	3112	-30.6	
TOTAL VOLATILE	497(16)	614(16)	539(12)	683(12)	304	1300	-26.7	
SUSPENDED	311(16)	732(16)	359(12)	898(12)	170	2436	-150.4	
VOLATILE SUSP.	162(12)	456(12)	163(11)	507(10)	166	1152	-211.7	
SETT.SOLIDS(ML/L)	1.5(16)	44.0(16)	1.8(12)	55.1(12)	8.0	120.0		
APPARENT COLOR	1258(16)	1849(16)	1511(12)	2238(12)	450	4770	-48.1	
PH	8.1(16)	7.5(16)	8.0(12)	7.5(12)	7.2	7.8	6.4	
AMMONIA N(MG/L)	12.5(16)	0.9(4)	13.5(12)	1.1(3)	0.2	2.6	91.4	
PHOSPHATE P(MG/L)	2.1(15)	1.8(4)	1.7(11)	1.5(3)	0.7	2.3	12.9	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	3.6(15)	0.0(0)	3.1(11)	1.3	4.6		

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
75.1% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
84.0% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 90

TABLE 91

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 11
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF1
TEST WAS FROM 10/13/69 THROUGH 12/19/69 WITH EDITED AVERAGE FROM 12/ 8/69 TO 12/19/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	66.6(27)	40.0(27)	66.6(7)	40.0(7)	40.0	40.0		
DEPTH(FT)	24.0(27)	5.5(27)	24.0(7)	5.5(7)	5.5	5.5		
RECYCLE(GPM)	0.0(27)	0.0(0)	0.0(7)	0.0(0)				
D.O.(MG/L)	5.6(23)	6.4(24)	6.0(6)	6.5(6)	6.1	7.4		
TEMP(DEG C)	29(22)	15(24)	27(6)	15(6)	12	16		
BOD5(MG/L)								
MIXED	225(26)	134(27)	208(7)	89(7)	40	118	57.3	68.5
SETTLED	0(0)	43(25)	0(0)	40(7)	28	50		
SOLIDS(MG/L)								
TOTAL	1869(25)	1857(27)	1772(7)	1650(7)	1398	1865	6.8	10.5
TOTAL VOLATILE	750(25)	693(27)	546(7)	478(7)	338	585	12.5	29.0
SUSPENDED	497(24)	518(25)	314(7)	239(6)	110	320	24.0	29.5
VOLATILE SUSP.	241(19)	298(23)	173(5)	152(4)	90	260	12.2	21.5
SETT.SOLIDS(ML/L)	5.7(26)	23.0(27)	3.8(7)	14.2(7)	7.0	20.0		
APPARENT COLOR	1702(25)	1234(27)	1521(7)	999(7)	810	1310	34.3	37.5
PH	7.4(26)	7.3(27)	7.3(7)	7.3(7)	7.0	8.0	-0.3	-0.9
AMMONIA N(MG/L)	7.7(7)	4.7(7)	5.2(2)	5.9(2)	5.7	6.1	-12.3	55.0
PHOSPHATE P(MG/L)	2.2(7)	2.2(7)	2.1(2)	3.2(2)	2.6	3.8	-48.8	27.6
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	6.4(24)	0.0(0)	6.4(6)	6.1	7.4		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	188.6(26)	0.0(0)	188.5(7)	0.0(0)				

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
54.9% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
80.7% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT
85.8% REMOVAL OF PF TO SETTLED EFFLUENT
( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 12
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF2
TEST WAS FROM 1/ 5/70 THROUGH 3/ 8/70 WITH EDITED AVERAGE FROM 2/ 2/70 TO 2/20/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	66.6(20)	33.2(20)	66.6(10)	33.2(9)	33.3	33.3		
DEPTH(FT)	24.0(20)	5.0(20)	24.0(10)	5.0(9)	5.0	5.0		
RECYCLE(GPM)	0.0(20)	0.0(0)	0.0(10)	0.0(0)				
D.O.(MG/L)	7.2(15)	5.6(15)	8.4(9)	5.5(8)	1.3	8.6		
TEMP(DEG C)	25(15)	13(15)	25(9)	11(8)	8	14		
BOD5(MG/L)								
MIXED	389(20)	124(20)	461(10)	164(9)	61	295	64.2	70.9
SETTLED	389(20)	105(20)	458(10)	146(9)	52	256	68.0	
SOLIDS(MG/L)								
TOTAL	2435(20)	2105(18)	2773(10)	2372(8)	2040	2750	14.4	20.4
TOTAL VOLATILE	1050(20)	806(18)	1242(10)	935(8)	710	1141	24.7	31.7
SUSPENDED	616(20)	451(17)	660(10)	483(7)	146	898	26.8	36.1
VOLATILE SUSP.	331(20)	294(17)	369(10)	328(7)	114	542	11.1	24.0
SETT.SOLIDS(ML/L)	1.7(20)	2.0(20)	0.9(10)	1.4(9)	0.1	6.5		
APPARENT COLOR	3643(20)	2803(20)	4115(10)	3429(9)	2695	4310	16.6	31.9
PH	8.6(20)	8.0(20)	8.8(10)	8.3(9)	7.9	8.8	5.9	8.7
AMMONIA N(MG/L)	24.3(6)	7.4(6)	17.8(3)	7.9(3)	0.0	12.3	55.5	56.9
PHOSPHATE P(MG/L)	6.7(6)	4.6(4)	5.1(3)	3.7(2)	3.0	4.4	27.9	30.0
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	6.5(14)	0.0(0)	6.7(7)	2.2	9.6		
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)				
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)				
SLUDGE(ML/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
11.0% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
68.2% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT
74.1% REMOVAL OF PF TO SETTLED EFFLUENT
( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 92

TABLE 93

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST AL 13
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 3/ 9/70 THROUGH 5/ 1/70 WITH EDITED AVERAGE FROM 4/20/70 TO 5/ 1/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	16.0(22)	0.0(0)	16.0(8)	16.0	16.0		
DEPTH(FT)	0.0(0)	7.7(22)	0.0(0)	7.7(8)	7.7	7.7		
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	1.3(16)	0.8(17)	0.2(7)	0.3(8)	0.3	0.5		
TEMP(DEG C)	32(16)	20(17)	34(7)	23(8)	21	25		
BOD5(MG/L)								
MIXED	594(22)	91(22)	625(8)	116(8)	101	139	81.4	
SETTLED	0(0)	87(21)	0(0)	104(8)	78	138		
SOLIDS(MG/L)								
TOTAL	2599(22)	2204(22)	2636(8)	2373(8)	2204	2582	9.9	
TOTAL VOLATILE	1216(22)	908(22)	1307(8)	1021(8)	889	1108	21.8	
SUSPENDED	580(21)	388(21)	469(7)	588(7)	360	1096	-25.3	
VOLATILE SUSP.	341(21)	301(17)	303(7)	411(6)	232	668	-35.2	
SETT.SOLIDS(ML/L)	0.5(22)	0.7(22)	0.4(8)	1.6(8)	0.0	5.5		
APPARENT COLOR	4509(22)	2895(22)	4594(8)	3416(8)	2910	4200	25.6	
PH	9.2(22)	7.9(22)	9.0(8)	7.8(8)	7.6	8.0	13.6	
AMMONIA N(MG/L)	23.9(18)	25.1(4)	8.2(4)	29.8(1)	29.8	29.8	-260.1-	
PHOSPHATE P(MG/L)	10.2(18)	7.1(4)	7.9(4)	8.2(1)	8.2	8.2	-2.8	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.8(17)	0.0(0)	0.4(8)	0.4	0.5		

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS
10.6% REMOVAL OF MIXED EFFLUENT TO SETTLED EFFLUENT
83.3% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 1
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 6/17/68 THROUGH 7/28/68 WITH EDITED AVERAGE FROM 7/ 3/68 TO 7/28/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	36.2(15)	0.0(0)	35.8(10)	35.2	36.5		
DEPTH(FT)	0.0(0)	6.7(15)	0.0(0)	6.7(10)	6.7	6.7		
RECYCLE(GPM)	0.0(0)	0.0(15)	0.0(0)	0.0(10)	0.0	0.0		
D.O.(MG/L)	2.9(8)	0.0(0)	2.7(5)	0.0(0)				
TEMP(DEG C)	37(8)	30(10)	37(5)	31(5)	30	32		
BOD5(MG/L)								
MIXED	204(15)	62(14)	220(10)	72(9)	47	92	67.0	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1019(13)	980(6)	1072(9)	980(6)	412	1255	8.6	
TOTAL VOLATILE	331(13)	310(6)	363(9)	310(6)	186	401	14.4	
SUSPENDED	235(14)	358(5)	239(10)	358(5)	232	590	-49.4	
VOLATILE SUSP.	109(13)	158(5)	110(10)	158(5)	90	200	-43.8	
SETT.SOLIDS(ML/L)	0.5(10)	2.0(8)	0.8(6)	2.6(4)	0.7	7.5		
APPARENT COLOR	1265(11)	1203(13)	1309(7)	1239(9)	780	2485	5.3	
PH	7.6(12)	7.5(10)	7.6(10)	7.4(9)	7.3	7.7	2.3	
AMMONIA N(MG/L)	5.7(12)	1.5(9)	6.0(10)	1.5(9)	0.7	2.1	74.2	
PHOSPHATE P(MG/L)	0.8(12)	1.0(9)	0.8(10)	1.0(9)	0.5	1.7	-21.6	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	3.4(10)	0.0(0)	3.3(5)	2.4	5.2		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 94

TABLE 95

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 2
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 7/29/68 THROUGH 9/ 8/68 WITH EDITED AVERAGE FROM 8/21/68 TO 9/ 8/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	52.5(14)	0.0(0)	52.1(4)	50.0	52.9		
DEPTH(FT)	0.0(0)	7.0(14)	0.0(0)	7.0(4)	7.0	7.0		
RECYCLE(GPM)	0.0(0)	0.0(14)	0.0(0)	0.0(4)	0.0	0.0		
D.O.(MG/L)	3.1(12)	0.0(0)	2.6(5)	0.0(0)				
TEMP(DEG C)	38(12)	31(7)	38(5)	31(1)	31	31		
BOD5(MG/L)								
MIXED	189(14)	97(11)	190(5)	81(4)	53	121	57.3	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1516(13)	1319(11)	1418(5)	1496(4)	1290	1615	-5.4	
TOTAL VOLATILE	584(13)	467(11)	585(5)	554(4)	495	643	5.2	
SUSPENDED	388(13)	423(11)	390(5)	534(4)	352	760	-37.0	
VOLATILE SUSP.	154(13)	216(11)	151(5)	277(4)	210	370	-83.7	
SETT.SOLIDS(ML/L)	2.7(13)	12.8(11)	6.2(5)	17.5(4)	10.0	25.0		
APPARENT COLOR	1876(11)	1301(10)	1667(5)	1726(4)	1270	2160	-3.5	
PH	8.2(13)	7.5(11)	8.4(5)	7.6(4)	7.5	7.8	9.2	
AMMONIA N(MG/L)	6.9(12)	2.0(10)	2.7(5)	2.3(4)	0.0	3.4	16.9	
PHOSPHATE P(MG/L)	2.4(12)	2.6(10)	3.6(5)	4.1(4)	1.9	9.0	-12.7	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	1.5(9)	0.0(0)	1.5(4)	0.9	2.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 3
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 10/28/68 THROUGH 12/ 6/68 WITH EDITED AVERAGE FROM 11/25/68 TO 12/ 6/68

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.
FEED(GPM)	0.0(0)	109.3(17)	0.0(0)	109.3(6)	109.4	109.4
DEPTH(FT)	0.0(0)	7.0(18)	0.0(0)	7.0(6)	7.0	7.0
RECYCLE(GPM)	0.0(0)	60.0(17)	0.0(0)	60.0(6)	60.0	60.0
D.O.(MG/L)	4.9(13)	0.0(0)	3.3(3)	0.0(0)		
TEMP(DEG C)	35(12)	23(15)	35(3)	23(5)	22	24
BOD5(MG/L)						
MIXED	233(18)	24(1)	229(5)	0(0)		
SETTLED	0(0)	31(17)	0(0)	46(6)	34	54
SOLIDS(MG/L)						
TOTAL	1365(18)	2233(16)	1090(5)	2621(5)	1560	5233
TOTAL VOLATILE	524(18)	878(16)	390(5)	980(5)	541	2022
SUSPENDED	463(18)	1269(15)	353(5)	1645(4)	710	4326
VOLATILE SUSP.	190(18)	563(14)	155(5)	613(4)	136	1672
SETT.SOLIDS(ML/L)	1.3(16)	80.1(12)	0.6(4)	47.8(5)	0.2	126.0
APPARENT COLOR	2211(16)	3498(16)	1788(4)	4574(5)	1670	9600
PH	8.1(17)	7.3(16)	7.5(5)	7.3(5)	7.3	7.4
AMMONIA N(MG/L)	10.0(18)	0.8(1)	6.1(5)	0.0(0)		
PHOSPHATE P(MG/L)	1.9(18)	1.0(1)	1.8(5)	0.0(0)		
UNIT CONTENTS						
D.O.(MG/L)	0.0(0)	4.9(7)	0.0(0)	4.4(4)	2.5	6.0

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS

80.0% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 96

TABLE 97

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 4
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO OD
TEST WAS FROM 10/28/68 THROUGH 12/ 6/68 WITH EDITED AVERAGE FROM 11/25/68 TO 12/ 6/68

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	109.3(17)	0.0(0)	109.3(6)	109.4	109.4		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	4.9(13)	0.0(0)	3.3(3)	0.0(0)				
TEMP(DEG C)	35(12)	0(0)	35(3)	0(0)				
BOD5(MG/L)								
MIXED	233(18)	31(17)	229(5)	46(6)	34	54	80.0	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1365(18)	1014(16)	1090(5)	1126(6)	1023	1185	-3.4	
TOTAL VOLATILE	524(18)	305(16)	390(5)	357(6)	298	462	8.5	
SUSPENDED	463(18)	123(14)	353(5)	125(4)	88	144	64.6	
VOLATILE SUSP.	190(18)	71(10)	155(5)	72(4)	34	118	53.6	
SETT.SOLIDS(ML/L)	1.3(16)	2.2(16)	0.6(4)	0.6(5)	0.1	1.5		
APPARENT COLOR	2211(16)	1089(16)	1788(4)	763(6)	600	875	57.3	
PH	8.1(17)	7.4(16)	7.5(5)	7.4(6)	7.4	7.6	1.2	
AMMONIA N(MG/L)	10.0(18)	0.6(17)	6.1(5)	0.8(6)	0.0	1.8	85.9	
PHOSPHATE P(MG/L)	1.9(18)	0.6(17)	1.8(5)	0.7(6)	0.5	1.4	59.2	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
SOLIDS(MG/L)								
SUSPENDED	0(0)	0(0)	0(0)	0(0)	0	0		
VOLATILE SUSP.	0(0)	0(0)	0(0)	0(0)	0	0		
SLUDGE(ML/L)	0.0(0)	136.8(8)	0.0(0)	192.5(2)	55.0	330.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 4
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 2/ 3/69 THROUGH 3/30/69 WITH EDITED AVERAGE FROM 3/10/69 TO 3/30/69

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.
FEED(GPM)	0.0(0)	61.0(16)	0.0(0)	60.8(9)	60.0	62.5
DEPTH(FT)	0.0(0)	4.0(16)	0.0(0)	4.0(9)	4.0	4.0
RECYCLE(GPM)	0.0(0)	70.2(16)	0.0(0)	71.1(9)	60.0	80.0
D.O.(MG/L)	6.1(21)	0.9(14)	5.8(9)	1.0(7)	0.3	4.8
TEMP(DEG C)	31(21)	22(15)	31(9)	21(8)	19	24
BOD5(MG/L)						
MIXED	249(24)	0(0)	220(11)	0(0)		
SETTLED	0(0)	66(15)	0(0)	77(9)	50	89
SOLIDS(MG/L)						
TOTAL	1993(23)	0(0)	1883(10)	0(0)		
TOTAL VOLATILE	647(23)	0(0)	560(10)	0(0)		
SUSPENDED	485(23)	446(15)	514(10)	459(8)	226	1402
VOLATILE SUSP.	161(23)	230(15)	183(10)	237(8)	152	572
SETT.SOLIDS(ML/L)	7.2(23)	3.6(15)	8.3(10)	5.8(8)	0.2	33.0
APPARENT COLOR	2040(23)	1740(15)	1993(10)	1838(8)	850	5200
PH	7.5(18)	7.2(15)	7.6(7)	7.2(8)	6.9	7.6
AMMONIA N(MG/L)	7.0(18)	0.0(0)	7.7(7)	0.0(0)		
PHOSPHATE P(MG/L)	2.8(18)	0.0(0)	3.3(7)	0.0(0)		
UNIT CONTENTS						
D.O.(MG/L)	0.0(0)	1.1(14)	0.0(0)	1.2(7)	0.4	4.8

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS

64.7% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 98

TABLE 66

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 5
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO OD
TEST WAS FROM 2/ 3/69 THROUGH 3/30/69 WITH EDITED AVERAGE FROM 3/10/69 TO 3/30/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	62.5(16)	0.0(0)	62.5(9)	62.5	62.5		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	6.1(21)	0.0(0)	5.8(9)	0.0(0)				
TEMP(DEG C)	31(21)	0(0)	31(9)	0(0)				
BOD5(MG/L)								
MIXED	249(24)	66(15)	220(11)	77(9)	50	89	64.7	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1993(23)	1497(16)	1883(10)	1455(9)	1259	1601	22.7	
TOTAL VOLATILE	647(23)	463(16)	560(10)	422(9)	359	484	24.5	
SUSPENDED	485(23)	284(16)	514(10)	262(9)	110	398	48.9	
VOLATILE SUSP.	161(23)	158(16)	183(10)	157(9)	64	300	14.1	
SETT.SOLIDS(ML/L)	7.2(23)	0.5(16)	8.3(10)	0.5(9)	0.0	1.5		
APPARENT COLOR	2040(23)	1488(16)	1993(10)	1356(9)	1000	1750	31.9	
PH	7.5(18)	7.2(14)	7.6(7)	7.2(7)	6.9	7.5	5.0	
AMMONIA N(MG/L)	7.0(18)	3.2(3)	7.7(7)	1.9(1)	1.9	1.9	75.4	
PHOSPHATE P(MG/L)	2.8(18)	1.3(3)	3.3(7)	1.1(1)	1.1	1.1	67.6	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
SOLIDS(MG/L)								
SUSPENDED	0(0)	1285(11)	0(0)	1761(6)	358	4344		
VOLATILE SUSP.	0(0)	532(11)	0(0)	717(6)	244	1604		
SLUDGE(ML/L)	0.0(0)	23.7(14)	0.0(0)	21.4(7)	5.0	30.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 5
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 3/31/69 THROUGH 5/18/69 WITH EDITED AVERAGE FROM 4/28/69 TO 5/18/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.
FEED(GPM)	0.0(0)	31.1(21)	0.0(0)	31.1(10)	31.2	31.2
DEPTH(FT)	0.0(0)	4.0(21)	0.0(0)	4.0(10)	4.0	4.0
RECYCLE(GPM)	0.0(0)	40.0(21)	0.0(0)	40.0(10)	40.0	40.0
D.O.(MG/L)	5.9(18)	1.7(19)	6.0(11)	0.9(10)	0.6	2.0
TEMP(DEG C)	32(18)	22(19)	32(11)	24(10)	21	27
BOD5(MG/L)						
MIXED	221(21)	0(0)	209(11)	0(0)		
SETTLED	0(0)	43(19)	0(0)	39(10)	23	72
SOLIDS(MG/L)						
TOTAL	1543(21)	0(0)	1497(11)	0(0)		
TOTAL VOLATILE	543(21)	0(0)	494(11)	0(0)		
SUSPENDED	361(20)	4674(19)	284(11)	7711(10)	1836	17476
VOLATILE SUSP.	206(20)	1766(19)	129(11)	2848(10)	790	6176
SETT.SOLIDS(ML/L)	0.8(21)	277.7(20)	0.9(11)	516.5(10)	75.0	975.0
APPARENT COLOR	1576(21)	10963(20)	1509(11)	19300(10)	5000	32767
PH	7.6(20)	7.3(20)	7.3(11)	7.3(10)	7.2	7.6
AMMONIA N(MG/L)	10.6(20)	0.0(0)	13.0(11)	0.0(0)		
PHOSPHATE P(MG/L)	3.1(20)	0.0(0)	3.5(11)	0.0(0)		
UNIT CONTENTS						
D.O.(MG/L)	0.0(0)	1.9(18)	0.0(0)	1.2(10)	0.6	2.5

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS

81.4% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 100

TABLE 101

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 6
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO OD
TEST WAS FROM 3/31/69 THROUGH 5/18/69 WITH EDITED AVERAGE FROM 4/28/69 TO 5/18/69

PARAMETER	AVERAGE OF ALL DATA INFLUENT	AVERAGE OF ALL DATA EFFLUENT	EDITED DATA AVERAGE INFLUENT	EDITED DATA AVERAGE EFFLUENT	EFFLUENT* MIN.	EFFLUENT* MAX.	%REDUCTION* UNIT	%REDUCTION* OVERALL
FEED(GPM)	0.0(0)	31.1(20)	0.0(0)	31.1(10)	31.2	31.2		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	5.9(18)	0.0(0)	6.0(11)	0.0(0)				
TEMP(DEG C)	32(18)	0(0)	32(11)	0(0)				
BOD5(MG/L)								
MIXED	221(21)	43(19)	209(11)	39(10)	23	72	81.4	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1543(21)	1268(19)	1497(11)	1282(10)	1195	1406	14.3	
TOTAL VOLATILE	543(21)	358(19)	494(11)	330(10)	260	399	33.3	
SUSPENDED	361(20)	196(19)	284(11)	228(10)	110	324	19.5	
VOLATILE SUSP.	206(20)	111(18)	129(11)	114(9)	18	224	11.6	
SETT.SOLIDS(ML/L)	0.8(21)	0.4(18)	0.9(11)	0.6(10)	0.0	3.5		
APPARENT COLOR	1576(21)	1091(16)	1509(11)	1135(10)	800	1400	24.7	
PH	7.6(20)	7.4(19)	7.3(11)	7.4(10)	7.3	7.6	-0.9	
AMMONIA N(MG/L)	10.6(20)	7.3(4)	13.0(11)	9.6(2)	9.5	9.8	26.1	
PHOSPHATE P(MG/L)	3.1(20)	1.8(4)	3.5(11)	2.1(2)	1.8	2.5	39.0	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
SOLIDS(MG/L)								
SUSPENDED	0(0)	4984(19)	0(0)	8750(10)	1558	17620		
VOLATILE SUSP.	0(0)	1667(19)	0(0)	2816(10)	604	4935		
SLUDGE(ML/L)	0.0(0)	271.5(20)	0.0(0)	528.0(10)	40.0	950.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 102

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 6
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 5/19/69 THROUGH 6/27/69 WITH EDITED AVERAGE FROM 6/ 9/69 TO 6/27/69

PARAMETER	AVERAGE OF ALL DATA INFLUENT	AVERAGE OF ALL DATA EFFLUENT	EDITED DATA AVERAGE INFLUENT	EDITED DATA AVERAGE EFFLUENT	EFFLUENT* MIN.	EFFLUENT* MAX.
FEED(GPM)	0.0(0)	80.3(18)	0.0(0)	79.8(9)	71.0	81.0
DEPTH(FT)	0.0(0)	5.1(18)	0.0(0)	5.1(9)	5.2	5.2
RECYCLE(GPM)	0.0(0)	40.0(18)	0.0(0)	40.0(9)	40.0	40.0
D.O.(MG/L)	4.9(18)	1.4(17)	5.4(9)	1.3(9)	0.5	3.1
TEMP(DEG C)	36(18)	30(17)	37(9)	30(9)	28	33
BOD5(MG/L)						
MIXED	192(21)	0(0)	215(11)	0(0)		
SETTLED	0(0)	36(17)	0(0)	29(8)	21	60
SOLIDS(MG/L)						
TOTAL	1501(21)	0(0)	1475(11)	0(0)		
TOTAL VOLATILE	530(21)	0(0)	526(11)	0(0)		
SUSPENDED	399(21)	2551(18)	409(11)	2857(9)	878	7872
VOLATILE SUSP.	165(21)	1218(18)	169(11)	1395(9)	408	3723
SETT.SOLIDS(ML/L)	2.3(22)	241.3(18)	3.4(11)	320.2(9)	80.0	840.0
APPARENT COLOR	1716(22)	5497(18)	1809(11)	6356(9)	2300	16400
PH	7.4(17)	7.6(18)	7.8(8)	7.7(9)	7.5	8.1
AMMONIA N(MG/L)	10.4(17)	0.0(0)	13.2(8)	0.0(0)		
PHOSPHATE P(MG/L)	3.3(17)	0.0(0)	3.7(8)	0.0(0)		
UNIT CONTENTS						
D.O.(MG/L)	0.0(0)	1.6(17)	0.0(0)	1.5(9)	0.7	3.5

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS

86.6% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 103

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 7
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO OD
TEST WAS FROM 5/19/69 THROUGH 6/27/69 WITH EDITED AVERAGE FROM 6/ 9/69 TO 6/27/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	80.6(18)	0.0(0)	80.8(9)	80.0	81.0		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	4.9(18)	0.0(0)	5.4(9)	0.0(0)				
TEMP(DEG C)	36(18)	0(0)	37(9)	0(0)				
BOD5(MG/L)								
MIXED	192(21)	36(17)	215(11)	29(8)	21	60	86.6	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1501(21)	1146(17)	1475(11)	1077(8)	°30	1213	26.9	
TOTAL VOLATILE	530(21)	310(17)	526(11)	284(8)	179	369	45.9	
SUSPENDED	399(21)	133(17)	409(11)	69(8)	32	136	83.2	
VOLATILE SUSP.	165(21)	76(14)	169(11)	41(6)	20	92	75.8	
SETT.SOLIDS(ML/L)	2.3(22)	2.3(17)	3.4(11)	0.5(8)	0.0	1.5		
APPARENT COLOR	1716(22)	1465(17)	1809(11)	1313(8)	300	6500	27.4	
PH	7.4(17)	7.7(18)	7.8(8)	7.8(9)	7.6	8.1	0.1	
AMMONIA N(MG/L)	10.4(17)	1.8(2)	13.2(8)	2.4(1)	2.4	2.4	81.8	
PHOSPHATE P(MG/L)	3.3(17)	1.6(2)	3.7(8)	2.6(1)	2.6	2.6	30.2	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
SOLIDS(MG/L)								
SUSPENDED	0(0)	5491(16)	0(0)	7069(8)	2962	12836		
VOLATILE SUSP.	0(0)	2588(16)	0(0)	3365(8)	1548	5735		
SLUDGE(ML/L)	0.0(0)	500.0(16)	0.0(0)	816.2(8)	420.0	980.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 7
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF

TEST WAS FROM 6/30/69 THROUGH 8/31/69 WITH EDITED AVERAGE FROM 7/28/69 TO 8/31/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.
FEED(GPM)	0.0(0)	40.5(14)	0.0(0)	40.5(6)	40.5	40.5
DEPTH(FT)	0.0(0)	5.1(14)	0.0(0)	5.1(6)	5.2	5.2
RECYCLE(GPM)	0.0(0)	40.0(14)	0.0(0)	40.0(6)	40.0	40.0
D.O.(MG/L)	2.9(16)	2.6(13)	2.2(13)	2.5(5)	0.6	4.2
TEMP(DEG C)	37(16)	29(13)	36(13)	29(5)	27	29
BOD5(MG/L)						
MIXED	207(20)	0(0)	199(15)	0(0)		
SETTLED	0(0)	21(17)	0(0)	12(5)	6	26
SOLIDS(MG/L)						
TOTAL	1300(19)	0(0)	1271(15)	0(0)		
TOTAL VOLATILE	488(19)	0(0)	499(15)	0(0)		
SUSPENDED	354(19)	3220(14)	365(15)	3688(5)	954	990
VOLATILE SUSP.	166(19)	1415(14)	180(15)	1555(5)	536	3983
SETT.SOLIDS(ML/L)	2.9(16)	221.3(12)	2.0(13)	230.0(4)	70.0	590.0
APPARENT COLOR	1566(18)	6514(13)	1583(15)	6036(5)	2300	10800
PH	7.8(17)	7.6(14)	7.9(15)	7.6(5)	7.6	7.8
AMMONIA N(MG/L)	11.0(18)	3.9(1)	9.0(15)	0.0(0)		
PHOSPHATE P(MG/L)	3.3(16)	1.6(1)	2.7(14)	0.0(0)		
UNIT CONTENTS						
D.O.(MG/L)	0.0(0)	2.6(13)	0.0(0)	2.5(5)	0.6	4.3

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS

93.7% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 104

TABLE 105

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 8
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO OD

TEST WAS FROM 6/30/69 THROUGH 8/31/69 WITH EDITED AVERAGE FROM 7/28/69 TO 8/31/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	40.5(14)	0.0(0)	40.5(6)	40.5	40.5		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	2.9(16)	0.0(0)	2.2(13)	0.0(0)				
TEMP(DEG C)	37(16)	0(0)	36(13)	0(0)				
BOD5(MG/L)								
MIXED	207(20)	21(17)	199(15)	12(5)	6	26	93.7	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1300(19)	945(14)	1271(15)	927(5)	797	1084	27.0	
TOTAL VOLATILE	488(19)	285(14)	499(15)	290(5)	182	486	41.8	
SUSPENDED	354(19)	141(13)	365(15)	129(5)	90	194	64.7	
VOLATILE SUSP.	166(19)	89(9)	180(15)	88(4)	56	126	50.9	
SETT.SOLIDS(ML/L)	2.9(16)	0.3(12)	2.0(13)	0.8(4)	0.2	2.0		
APPARENT COLOR	1566(18)	591(13)	1583(15)	502(5)	250	980	68.2	
PH	7.8(17)	7.7(13)	7.9(15)	7.8(5)	7.8	7.9	1.6	
AMMONIA N(MG/L)	11.0(18)	0.3(3)	9.0(15)	0.4(2)	0.1	0.8	95.0	
PHOSPHATE P(MG/L)	3.3(16)	2.3(3)	2.7(14)	2.8(2)	1.9	3.8	-2.8	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
SOLIDS(MG/L)								
SUSPENDED	0(0)	9475(14)	0(0)	7803(5)	4000	10548		
VOLATILE SUSP.	0(0)	4607(14)	0(0)	3502(5)	1880	4248		
SLUDGE(ML/L)	0.0(0)	580.0(13)	0.0(0)	810.0(5)	295.0	975.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 8
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF
TEST WAS FROM 9/ 1/69 THROUGH 10/12/69 WITH EDITED AVERAGE FROM 9/22/69 TO 10/12/69

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.
FEED(GPM)	0.0(0)	66.6(16)	0.0(0)	66.6(10)	66.7	66.7
DEPTH(FT)	0.0(0)	8.5(16)	0.0(0)	8.5(10)	8.5	8.5
RECYCLE(GPM)	0.0(0)	30.0(16)	0.0(0)	30.0(10)	30.0	30.0
D.O.(MG/L)	5.5(14)	1.3(15)	5.9(10)	1.6(9)	0.5	3.5
TEMP(DEG C)	35(14)	27(15)	35(10)	27(9)	23	29
BOD5(MG/L)						
MIXED	198(16)	30(13)	185(12)	25(7)	12	50
SETTLED	0(0)	26(16)	0(0)	19(10)	14	28
SOLIDS(MG/L)						
TOTAL	1259(16)	0(0)	1223(12)	0(0)		
TOTAL VOLATILE	497(16)	0(0)	480(12)	0(0)		
SUSPENDED	311(16)	3028(16)	281(12)	3545(10)	1308	11498
VOLATILE SUSP.	162(12)	1604(16)	155(8)	1873(10)	918	5694
SETT.SOLIDS(ML/L)	1.5(16)	308.0(15)	1.8(12)	362.5(10)	100.0	900.0
APPARENT COLOR	1258(16)	6514(16)	1079(12)	7512(10)	620	26000
PH	8.1(16)	7.4(16)	8.1(12)	7.3(10)	7.1	7.6
AMMONIA N(MG/L)	12.5(16)	0.0(0)	11.8(12)	0.0(0)		
PHOSPHATE P(MG/L)	2.1(15)	0.0(0)	2.4(12)	0.0(0)		
UNIT CONTENTS						
D.O.(MG/L)	0.0(0)	1.4(15)	0.0(0)	1.6(9)	0.6	3.6

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS

89.8% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE *INDICATES EDITED DATA

TABLE 106

TABLE 107

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 9
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS PF TO OD
TEST WAS FROM 9/ 1/69 THROUGH 10/12/69 WITH EDITED AVERAGE FROM 9/22/69 TO 10/12/69

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	0.0(0)	66.6(16)	0.0(0)	66.6(10)	66.7	66.7		
DEPTH(FT)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
RECYCLE(GPM)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
D.O.(MG/L)	5.5(14)	0.0(0)	5.9(10)	0.0(0)				
TEMP(DEG C)	35(14)	0(0)	35(10)	0(0)				
BOD5(MG/L)								
MIXED	198(16)	26(16)	185(12)	19(10)	14	28	89.8	
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	1259(16)	1011(16)	1223(12)	951(10)	830	1084	22.2	
TOTAL VOLATILE	497(16)	322(16)	480(12)	304(10)	208	487	36.7	
SUSPENDED	311(16)	137(16)	281(12)	92(10)	50	142	67.0	
VOLATILE SUSP.	162(12)	107(6)	155(8)	80(3)	56	98	48.3	
SETT.SOLIDS(ML/L)	1.5(16)	0.6(16)	1.8(12)	0.2(10)	0.1	0.5		
APPARENT COLOR	1258(16)	464(16)	1079(12)	332(10)	180	510	69.2	
PH	8.1(16)	7.5(16)	8.1(12)	7.4(10)	7.4	7.6	8.6	
AMMONIA N(MG/L)	12.5(16)	1.7(4)	11.8(12)	0.5(3)	0.0	0.8	95.5	
PHOSPHATE P(MG/L)	2.1(15)	0.7(4)	2.4(12)	0.9(3)	0.8	1.1	60.4	
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
SOLIDS(MG/L)								
SUSPENDED	0(0)	7897(13)	0(0)	9754(9)	6622	14546		
VOLATILE SUSP.	0(0)	4019(13)	0(0)	4955(9)	3370	7197		
SLUDGE(ML/L)	0.0(0)	785.3(13)	0.0(0)	952.2(9)	930.0	990.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 9
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF2

TEST WAS FROM 1/ 5/70 THROUGH 3/ 8/70 WITH EDITED AVERAGE FROM 2/18/70 TO 3/ 8/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	66.6(20)	33.2(20)	66.6(6)	33.2(5)	33.3	33.3		
DEPTH(FT)	24.0(20)	4.2(20)	24.0(6)	4.3(5)	4.3	4.3		
RECYCLE(GPM)	0.0(20)	30.0(20)	0.0(6)	30.0(5)	30.0	30.0		
D.O.(MG/L)	7.2(15)	7.3(14)	7.8(5)	4.8(4)	4.1	5.9		
TEMP(DEG C)	25(15)	14(15)	25(5)	16(4)	14	17		
BOD5(MG/L)								
MIXED	389(20)	0(0)	593(6)	0(0)				
SETTLED	389(20)	82(18)	559(6)	88(5)	31	139	84.2	
SOLIDS(MG/L)								
TOTAL	2435(20)	0(0)	3206(6)	0(0)				
TOTAL VOLATILE	1050(20)	0(0)	1605(6)	0(0)				
SUSPENDED	616(20)	1160(14)	841(6)	1061(5)	476	1836		
VOLATILE SUSP.	331(20)	670(14)	490(6)	648(5)	334	1130		
SETT.SOLIDS(ML/L)	1.7(20)	29.0(17)	3.0(6)	28.2(5)	3.0	55.0		
APPARENT COLOR	3643(20)	3837(17)	5467(6)	3654(5)	2900	4900		
PH	8.6(20)	7.8(18)	8.9(6)	7.8(5)	7.4	8.3		
AMMONIA N(MG/L)	24.3(6)	0.0(0)	15.4(2)	0.0(0)				
PHOSPHATE P(MG/L)	6.7(6)	0.0(0)	6.2(2)	0.0(0)				
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	7.5(14)	0.0(0)	5.1(4)	4.4	5.9		

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS

85.1% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 108

TABLE 109

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 10
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF2 TO OD
TEST WAS FROM 1/ 5/70 THROUGH 3/ 8/70 WITH EDITED AVERAGE FROM 2/18/70 TO 3/ 8/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		*REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	66.6(20)	33.2(20)	66.6(6)	33.2(5)	33.3	33.3		
DEPTH(FT)	24.0(20)	0.0(0)	24.0(6)	0.0(0)				
RECYCLE(GPM)	0.0(20)	0.0(0)	0.0(6)	0.0(0)				
D.O.(MG/L)	7.2(15)	0.0(0)	7.8(5)	0.0(0)				
TEMP(DEG C)	25(15)	0(0)	25(5)	0(0)				
BOD5(MG/L)								
MIXED	389(20)	82(18)	593(6)	88(5)	31	139	85.1	85.6
SETTLED	389(20)	0(0)	559(6)	0(0)				
SOLIDS(MG/L)								
TOTAL	2435(20)	1984(18)	3206(6)	2029(5)	1429	2571	36.7	34.7
TOTAL VOLATILE	1050(20)	713(18)	1605(6)	766(5)	412	1063	52.2	50.1
SUSPENDED	616(20)	443(18)	841(6)	614(5)	230	1678	27.0	30.0
VOLATILE SUSP.	331(20)	250(18)	490(6)	255(5)	146	338	47.8	48.1
SETT.SOLIDS(ML/L)	1.7(20)	1.4(18)	3.0(6)	0.1(5)	0.0	0.2		
APPARENT COLOR	3643(20)	2608(18)	5467(6)	2713(5)	1450	4900	50.3	49.0
PH	8.6(20)	7.7(18)	8.9(6)	7.7(5)	7.5	8.1	13.2	15.5
AMMONIA N(MG/L)	24.3(6)	3.8(4)	15.4(2)	2.8(2)	0.8	4.9	81.5	85.0
PHOSPHATE P(MG/L)	6.7(6)	6.0(3)	6.2(2)	5.8(2)	5.5	6.2	6.4	19.7
UNIT CONTENTS								
D.O.(MG/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
SOLIDS(MG/L)								
SUSPENDED	0(0)	933(3)	0(0)	933(3)	746	1044		
VOLATILE SUSP.	0(0)	537(3)	0(0)	537(3)	444	600		
SLUDGE(ML/L)	0.0(0)	20.0(3)	0.0(0)	20.0(3)	10.0	30.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST OD 10
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF1

TEST WAS FROM 3/ 9/70 THROUGH 5/ 1/70 WITH EDITED AVERAGE FROM 4/20/70 TO 5/ 1/70

	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*	
PARAMETER	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.
FEED(GPM)	33.2(22)	33.2(22)	33.2(8)	33.2(5)	33.3	33.3
DEPTH(FT)	24.0(22)	4.2(22)	24.0(8)	4.3(5)	4.3	4.3
RECYCLE(GPM)	33.2(22)	30.0(22)	33.2(8)	30.0(5)	30.0	30.0
D.O.(MG/L)	0.0(0)	5.6(16)	0.0(0)	4.4(4)	3.8	5.3
TEMP(DEG C)	28(16)	20(16)	31(7)	22(4)	21	23
BOD5(MG/L)						
MIXED	272(20)	0(0)	266(8)	0(0)		
SETTLED	0(0)	86(20)	0(0)	65(5)	45	91
SOLIDS(MG/L)						
TOTAL	2390(22)	0(0)	2418(8)	0(0)		
TOTAL VOLATILE	1022(22)	0(0)	1093(8)	0(0)		
SUSPENDED	522(21)	1671(22)	475(8)	2182(5)	248	4440
VOLATILE SUSP.	341(20)	1025(20)	344(7)	1466(4)	799	2336
SETT.SOLIDS(ML/L)	2.3(22)	58.5(22)	2.7(8)	75.6(5)	5.0	150.0
APPARENT COLOR	3682(22)	5270(22)	3588(8)	9810(5)	3400	18200
PH	8.2(22)	7.8(22)	8.0(8)	7.6(5)	7.3	7.9
AMMONIA N(MG/L)	9.1(5)	0.0(0)	2.1(1)	0.0(0)		
PHOSPHATE P(MG/L)	5.4(5)	0.0(0)	3.9(1)	0.0(0)		
UNIT CONTENTS						
D.O.(MG/L)	0.7(16)	5.7(16)	0.8(7)	4.5(4)	3.9	5.4
SOLIDS(MG/L)						
SUSPENDED	7567(18)	0(0)	2418(8)	0(0)		
VOLATILE SUSP.	1523(15)	0(0)	1425(7)	0(0)		
SLUDGE(ML/L)	30.2(18)	0.0(0)	18.7(8)	0.0(0)		

OTHER BOD EFFICIENCIES FROM EDITED DATA AS FOLLOWS

75.5% REMOVAL OF MIXED FEED TO SETTLED EFFLUENT

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

TABLE 110

TABLE 111

SUMMARY OF PILOT TREATMENT UNIT RESULTS FOR TEST CL2 11
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

INFLUENT SOURCE FOR TEST WAS TF1 TO OD
TEST WAS FROM 3/ 9/70 THROUGH 5/ 1/70 WITH EDITED AVERAGE FROM 4/20/70 TO 5/ 1/70

PARAMETER	AVERAGE OF ALL DATA		EDITED DATA AVERAGE		EFFLUENT*		%REDUCTION*	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	MIN.	MAX.	UNIT	OVERALL
FEED(GPM)	33.2(22)	33.2(22)	33.2(8)	33.2(5)	33.3	33.3		
DEPTH(FT)	24.0(22)	0.0(0)	24.0(8)	0.0(0)				
RECYCLE(GPM)	33.2(22)	0.0(0)	33.2(8)	0.0(0)				
D.O.(MG/L)	0.0(0)	0.0(0)	0.0(0)	0.0(0)				
TEMP(DEG C)	28(16)	0(0)	31(7)	0(0)				
BOD5(MG/L)								
MIXED	272(20)	86(20)	266(8)	65(5)	45	91	75.5	89.5
SETTLED	0(0)	0(0)	0(0)	0(0)				
SOLIDS(MG/L)								
TOTAL	2390(22)	2026(19)	2418(8)	2024(4)	1842	2188	16.3	23.2
TOTAL VOLATILE	1022(22)	781(19)	1093(8)	814(4)	690	921	25.5	37.6
SUSPENDED	522(21)	411(19)	475(8)	294(4)	224	364	38.0	37.3
VOLATILE SUSP.	341(20)	211(16)	344(7)	185(4)	161	244	46.1	38.9
SETT.SOLIDS(ML/L)	2.3(22)	1.3(20)	2.7(8)	0.8(5)	0.0	3.0		
APPARENT COLOR	3682(22)	3159(20)	3588(8)	3744(5)	3400	4600	-4.3	18.4
PH	8.2(22)	7.7(20)	8.0(8)	7.5(5)	7.5	7.7	5.8	16.1
AMMONIA N(MG/L)	9.1(5)	3.0(3)	2.?(1)	1.0(1)	1.0	1.0	52.3	87.9
PHOSPHATE P(MG/L)	5.4(5)	6.7(3)	3.9(1)	6.1(1)	6.1	6.1	-56.4	23.5
UNIT CONTENTS								
D.O.(MG/L)	0.7(16)	0.0(0)	0.8(7)	0.0(0)				
SOLIDS(MG/L)								
SUSPENDED	7567(18)	2163(18)	2418(8)	3540(5)	912	6080		
VOLATILE SUSP.	1523(15)	1173(18)	1425(7)	1921(5)	580	3200		
SLUDGE(ML/L)	30.2(18)	72.3(17)	18.7(8)	126.0(5)	30.0	300.0		

( ) DESIGNATES NUMBER OF VALUES IN AVERAGE

*INDICATES EDITED DATA

SHEET 1

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 172 IN FILE RECORD 1 DATA FOR 6/21/68

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		22.5	26.0	41.0	36.0	
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		23.0	24.0	0.0	0.0	
D.O.						
TEMP - C				26.0	29.0	
BOD5	200.0		168.0	32.0	62.0	
TS						
VTS						
SS						
VSS						
SETT SOL						
COLOR						
PH						
NITROGEN						
PHOSPHOR						
DO-CONT.				5.8	4.4	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

DAY 177 IN FILE RECORD 2 DATA FOR 6/26/68

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		22.0	22.0	41.0	38.0	
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		23.0	23.0	0.0	0.0	
D.O.						
TEMP - C				28.0	30.0	
BOD5	161.0	66.0	131.0	51.0	73.0	
TS	753.9					
VTS	77.9					
SS	272.2					
VSS	201.8					
SETT SOL	0.3	1.8	0.9		1.9	
COLOR	1690.0	1095.0	855.0	1140.0	1320.0	
PH						
NITROGEN						
PHOSPHOR						
DO-CONT.		0.4		2.7	1.3	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

DAY 179 IN FILE RECORD 3 DATA FOR 6/28/68

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		22.0	22.5	40.5	39.0	
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		23.0	20.0	0.0	0.0	
D.O.	3.4		3.6	3.2		
TEMP - C	32.0	32.0	32.0	23.0	26.0	
BOD5	172.0	58.0	75.0	16.0	26.0	
TS	899.9					
VTS	341.8					
SS	171.8					
VSS						
SETT SOL	0.1	0.6	0.4	0.1	0.1	
COLOR	1080.0	630.0	765.0	486.0	765.0	
PH						
NITROGEN						
PHOSPHOR						
DO-CONT.		0.5		2.9	4.7	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

DAY 184 IN FILE RECORD 4 DATA FOR 7/ 3/68

	PF	TF1	TF2	AL	OD DELETE	CL2
FEED-GPM		23.5	22.0	43.5	36.5	
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		25.0	25.0	0.0	0.0	
D.O.	0.2		5.3	2.5		
TEMP - C	32.0	28.0	26.0	27.0	29.0	
BOD5	187.0	52.0	68.0	29.0	21.0	
TS	1210.0					
VTS	310.9					
SS	314.0					
VSS	280.1					
SETT SOL		0.0	1.3	0.2	1.0	
COLOR	1925.0	850.0	1375.0	2250.0	1500.0	
PH	8.7	7.2	7.3	7.3		
NITROGEN	10.3	3.4	0.6	3.4		
PHOSPHOR	0.2	0.8	1.4	1.2		
DO-CONT.		0.3		2.4	4.7	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

SHEET 1

SHEET 2

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 191 IN FILE RECORD 5 DATA FOR 7/10/68

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		22.0	21.5	41.0	36.5	
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		23.0	21.0	0.0	0.0	
D.O.	3.0	1.5	3.7			
TEMP - C	34.0	30.0	31.0	28.0	30.0	
BOD5	228.0	87.0	54.0	174.0	92.0	
TS	980.9					
VTS	306.9					
SS	166.0					
VSS	97.9					
SETT SOL	0.6	0.1	1.1		1.2	
COLOR	1200.0	800.0	725.0	1650.0	1650.0	
PH	7.3	7.5	7.4	7.7	7.6	
NITROGEN	0.8	1.2	0.8	1.6	1.3	
PHOSPHOR	1.2	1.0	1.2	3.2	0.9	
DO-CONT.		3.0		4.3	5.2	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

DAY 192 IN FILE RECORD 6 DATA FOR 7/11/68

	PF	TF1	TF2	AL	OD	CL2
			DELETE			DELETE
FEED-GPM		22.0	24.0	42.0	36.5	
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		23.0	26.5	0.0	0.0	
D.O.						
TEMP - C						
BOD5	222.0	73.0	171.0	135.0	53.0	
TS	1154.9					
VTS	460.9					
SS	108.0					
VSS	65.9					
SETT SOL	0.1	4.7	0.8	6.9		
COLOR	1275.0	1300.0	1705.0	1350.0	1075.0	
PH	7.3	7.6	7.5	7.8	7.7	
NITROGEN	0.1	0.0	0.9	0.4	1.0	
PHOSPHOR	1.7	1.0	1.3	2.0	1.7	
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

DAY 193 IN FILE RECORD 7 DATA FOR 7/12/68

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		22.0	20.0	42.0	35.2	
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		22.0	22.0	0.0	0.0	
D.O.	4.0	6.2	6.0	3.6		
TEMP - C	37.0	32.0	33.0	28.0	30.0	
BOD5	139.0	48.0	73.0	33.0	34.0	
TS	839.9					
VTS	208.8					
SS	195.9					
VSS	83.9					
SETT SOL	0.1	0.5	0.1		2.6	
COLOR	875.0	755.0	875.0	775.0	900.0	
PH	7.3	7.2	7.2	7.4	7.7	
NITROGEN	2.4	0.4	1.7	0.4		
PHOSPHOR	1.2	0.6	0.5	0.8		
DO-CONT.		2.1		3.4	3.2	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

DAY 196 IN FILE RECORD 8 DATA FOR 7/15/68

	PF	TF1	TF2	AL	OD	CL2
			DELETE			DELETE
FEED-GPM		23.0	22.0	42.0	35.2	22.2
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		23.0	25.0	0.0	0.0	
D.O.	3.9		6.0	4.3		
TEMP - C	38.5	33.0	34.0	28.0	31.0	
BOD5	223.0	61.0	85.0	68.0	70.0	
TS	963.0					910.9
VTS	319.7					232.9
SS	204.1					187.9
VSS	78.1					79.9
SETT SOL	0.1	0.1	0.2	14.0	0.7	0.1
COLOR					780.0	
PH	7.2				7.7	
NITROGEN	5.9	1.7	2.2	0.5	1.7	
PHOSPHOR	1.2	0.5	0.4	0.9	0.9	
DO-CONT.		0.7		4.0	3.0	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 198 IN FILE RECORD 9 DATA FOR 7/17/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	42.0	35.2	22.0
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		22.2	23.0	0.0	0.0	
D.O.	3.0		6.2			
TEMP - C	40.0	34.0	36.0	31.0	32.0	
BOD5	223.0	81.0	75.0	46.0	88.0	61.0
TS	914.9				1066.8	814.0
VTS	289.8				319.9	232.9
SS	162.0					89.8
VSS	30.9					56.9
SETT SOL		1.3	0.1			0.1
COLOR	1700.0	1475.0	860.0	1760.0	2485.0	
PH	7.1	7.0	6.9	7.3	7.3	7.3
NITROGEN	8.6	2.7	5.2	1.0	1.9	1.8
PHOSPHOR	0.7	0.2	0.4	0.3	1.0	0.4
DO-CONT.				2.2	2.4	
SS-CONT.						
VSS-CONT						
SET-BOD			61.0			
SLUDGE-SETT						

DAY 199 IN FILE RECORD 10 DATA FOR 7/18/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2 DELETE
FEED-GPM		22.2	23.0	42.0	35.2	22.2
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		22.2	24.0	0.0	0.0	
D.O.	2.3		6.1			
TEMP - C	40.5	35.0	36.0	31.0		35.0
BOD5	194.0	25.0	56.0	125.0		36.0
TS	1107.0	813.9	830.9	1302.9		726.0
VTS	403.8	229.9	243.9	360.9		169.9
SS	254.2	181.8	151.9	440.0		83.9
VSS	26.2	95.8	65.9	183.9		46.0
SETT SOL	0.1	0.1	1.4			0.1
COLOR	1100.0		355.0	1550.0		265.0
PH	7.4	7.3	7.3	7.3		7.2
NITROGEN	5.8	4.3	3.0	1.9		3.0
PHOSPHOR	1.1	0.5	0.9	1.4		0.6
DO-CONT.		0.5		1.9		
SS-CONT.						
VSS-CONT						
SET-BOD			36.0			
SLUDGE-SETT						

DAY 200 IN FILE RECORD 11 DATA FOR 7/19/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	40.6	35.2	22.2
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		22.2	22.2	0.0	0.0	
D.O.						
TEMP - C				30.5	30.5	
BOD5	259.0	82.0	148.0	61.0	81.0	87.0
TS	1194.9	1085.9	1183.9	945.8	1071.0	937.0
VTS	453.9	395.9	413.8	344.9	346.9	318.9
SS	242.0	242.0	314.0	216.0	231.9	90.0
VSS	68.0	70.1	106.1	133.9	89.7	
SETT SOL	3.5					
COLOR	1200.0	1010.0	875.0	550.0	900.0	450.0
PH	7.5	7.3	7.2	7.4	7.3	7.2
NITROGEN	5.5	2.0	0.8	0.9	1.7	2.5
PHOSPHOR	1.3	1.0	1.1	1.1	1.4	0.9
DO-CONT.				3.0	2.4	
SS-CONT.						
VSS-CONT						
SET-BOD			87.0			
SLUDGE-SETT						

DAY 203 IN FILE RECORD 12 DATA FOR 7/22/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2 DELETE
FEED-GPM		22.2	22.2	41.0	36.5	22.2
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		22.2	24.5	0.0	0.0	
D.O.						
TEMP - C						
BOD5	211.0	36.0	77.0	73.0	47.0	74.0
TS	1153.1	1006.0	1067.9	1069.0	1020.0	995.0
VTS	392.9	317.8	315.9	297.9	298.8	279.0
SS	256.0	184.0	248.1	199.8	260.0	184.0
VSS	162.0	132.1	173.9	137.9	169.9	126.0
SETT SOL	0.0	0.3	0.3	2.0	1.0	
COLOR	725.0	890.0	740.0	810.0	925.0	750.0
PH	8.7	7.5	7.4	7.3	7.5	7.4
NITROGEN	7.8	4.4	3.9	2.0	2.1	1.7
PHOSPHOR	0.9	0.5	0.4	0.8	1.2	0.2
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			74.0			
SLUDGE-SETT						

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 205 IN FILE RECORD 13 DATA FOR 7/24/68

	PF	TF1	TF2 DELETE	AL	OD	CL2 DELETE
FEED-GPM		22.2	23.0	42.0	36.5	22.2
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		22.2	26.0		0.0	
D.O.	3.6	0.3				
TEMP - C	38.0	33.0	35.0		31.0	
BOD5	184.0	38.0	32.0	35.0	73.0	51.0
TS	1009.9		1103.9	912.9	1054.0	875.0
VTS	362.9		360.9	248.9	309.9	271.9
SS	234.0	208.1	262.1	95.8	287.7	92.0
VSS	91.8	92.1	120.2	49.7	148.0	46.9
SETT SOL	0.5	0.1	0.1		7.5	
COLOR	1140.0	960.0	790.0	550.0	990.0	550.0
PH	7.4	7.3	7.2	7.4	7.3	7.2
NITROGEN	5.0	1.3	1.4	1.1	0.7	3.4
PHOSPHOR	0.3	0.2	0.5	0.8	0.9	0.3
DO-CONT.		0.3			3.5	
SS-CONT.						
VSS-CONT						
SET-BOD			51.0			
SLUDGE-SETT		920.0				

DAY 206 IN FILE RECORD 14 DATA FOR 7/25/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2 DELETE
FEED-GPM		22.2	22.2	40.6	36.5	22.2
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		22.2	22.2	0.0	0.0	
D.O.						
TEMP - C						
BOD5	237.0	51.0	135.0	33.0	66.0	101.0
TS		1212.0	1174.9	991.9	1255.0	1054.0
VTS		356.8	413.9	288.9	400.9	314.0
SS	469.9	422.0	400.0	263.9	589.9	193.0
VSS	129.9	100.0	97.9		199.8	
SETT SOL						
COLOR		1050.0	810.0	650.0	1200.0	775.0
PH	7.1	7.3	7.4	7.9	7.6	7.1
NITROGEN	2.2	1.4	1.2	1.1	2.0	1.1
PHOSPHOR	0.5	0.2	0.3	0.4	0.5	0.2
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			101.0			
SLUDGE-SETT						

DAY 207 IN FILE RECORD 15 DATA FOR 7/26/68

	PF	TF1	TF2 DELETE	AL	OD	CL2 DELETE
FEED-GPM		22.2	22.2	40.6	35.2	30.0
DEPTH-FT		24.0	24.0	6.7	6.7	
RECY-GPM		22.2	30.0	0.0	0.0	
D.O.						
TEMP - C						
BOD5	223.0	60.0	86.0	60.0	82.0	175.0
TS	1069.9	1000.9	1013.0	1076.9	411.9	934.9
VTS	367.9	287.8	304.9	325.8	186.1	281.9
SS	238.0	244.1	261.8	274.0	419.9	111.9
VSS	95.8	106.2	127.8	115.9	184.0	43.9
SETT SOL		2.7				
COLOR		650.0	400.0	550.0	1150.0	550.0
PH	8.4	7.5	7.2	7.5	7.4	7.3
NITROGEN	14.6	1.7	0.8	3.6	1.7	1.9
PHOSPHOR	0.4	0.6	0.7	0.6	0.7	0.3
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			175.0			
SLUDGE-SETT		660.0				

DAY 217 IN FILE RECORD 16 DATA FOR 8/ 5/68

	PF	TF1	TF2	AL DELETE	OD DELETE	CL2
FEED-GPM		33.3	22.2	60.8	52.9	22.9
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		33.3	0.0	0.0	0.0	
D.O.	5.0	0.1				
TEMP - C	39.5	32.0	34.0	32.0	32.0	
BOD5	196.0	126.0	187.0	85.0	133.0	
TS	1475.9	1345.0	1806.9	1240.9	1203.0	1326.9
VTS	486.9	467.0	657.9	446.0	369.9	469.8
SS	381.0	417.9	877.0	413.0	476.9	411.9
VSS	109.9	173.9	324.0	185.0	211.9	160.9
SETT SOL	0.5	1.7	11.0		10.0	0.5
COLOR						
PH	7.9	7.6	7.7	7.3	7.3	7.5
NITROGEN	31.8	23.1	23.0	4.2	3.2	25.6
PHOSPHOR	0.6	0.8	2.9	0.7	1.2	0.7
DO-CONT.		0.1		1.2	0.7	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT		200.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 219 IN FILE RECORD 17 DATA FOR 8/ 7/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	24.0	59.0	51.0	22.2
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		33.3	0.0	0.0	0.0	
D.O.	3.9	0.2	6.3	1.7		
TEMP - C	36.0	34.0	34.0	31.0	32.5	33.0
BOD5	113.0	32.0	63.0	151.0	90.0	53.0
TS	950.0	910.9	1007.0	1595.0	995.9	899.9
VTS	250.9	229.9	276.9	530.0	298.8	231.9
SS	231.9	173.9	263.9	783.9	266.1	150.1
VSS	115.9	129.9	136.1	397.8	186.1	140.0
SETT SOL	2.0	3.0	3.5	20.0	12.0	0.5
COLOR			405.0	1490.0	560.0	399.0
PH	7.3	7.3	7.3	7.4	7.3	7.4
NITROGEN	5.9	4.9	6.8	9.0	3.0	8.2
PHOSPHOR	4.7	1.4	3.9	1.7	1.9	3.6
DO-CONT.		0.2		1.4	1.1	
SS-CONT.						
VSS-CONT						
SET-BOD			53.0			
SLUDGE-SETT		60.0				

DAY 220 IN FILE RECORD 18 DATA FOR 8/ 8/68

	PF	TF1	TF2	AL DELETE	OD DELETE	CL2
FEED-GPM		33.3	22.2	60.8	52.9	22.2
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		33.3	0.0	0.0	0.0	
D.O.	2.0	0.4	5.7	0.9		
TEMP - C	37.5	34.0	34.0	31.0	32.0	33.0
BOD5	277.0	136.0	145.0	205.0	160.0	
TS	1871.9	1416.0	1463.0	1942.1	1356.0	
VTS	723.8	470.9	496.8	669.0	405.4	
SS	597.8	414.1	302.1	1125.7	581.0	
VSS	235.8	187.9	130.0	489.7	257.9	
SETT SOL	0.1	0.3	2.5	2.9	20.0	
COLOR	2490.0	1670.0	1990.0	1670.0	1425.0	
PH	8.6	7.6	7.5	7.4	7.5	
NITROGEN	6.9	1.3	0.7	3.6	0.0	
PHOSPHOR	2.5	2.0	1.6	3.0	2.8	
DO-CONT.		0.4		0.0	0.4	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT		120.0				

DAY 221 IN FILE RECORD 19 DATA FOR 8/ 9/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	22.2	60.8	52.9	22.2
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		33.3	0.0	0.0	0.0	
D.O.						
TEMP - C						
BOD5	203.0	115.0	206.0	162.0	77.0	109.0
TS	2653.9	1363.9	1516.8	910.9	1194.9	1287.0
VTS	1066.8	519.9	596.8	229.5	373.8	461.9
SS	404.0	299.9	401.9	173.9	266.1	297.8
VSS	133.9	159.8	190.1	129.9	133.9	157.7
SETT SOL	0.3	3.0	5.5	50.0	3.0	0.7
COLOR	1990.0	2125.0	2205.0	3240.0	1250.0	1890.0
PH	9.1	7.6	7.4	7.6	7.6	7.4
NITROGEN		2.9	0.0	1.7	1.3	0.9
PHOSPHOR		1.6	0.2	4.2	0.8	1.8
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			109.0			
SLUDGE-SETT		300.0				

DAY 224 IN FILE RECORD 20 DATA FOR 8/12/68

	PF	TF1	TF2	AL	OD DELETE	CL2
FEED-GPM		33.3	22.2	59.0	51.5	22.2
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		33.3	0.0	0.0	0.0	
D.O.	7.7	0.0	8.5	2.6		
TEMP - C	37.0	30.0	30.0	27.0	27.0	27.0
BOD5	169.0	113.0	124.0		42.0	97.0
TS	1240.9	1045.9	1157.9		965.1	1142.9
VTS	421.9	373.9	358.8		268.9	374.8
SS	299.9	142.2	254.2		128.1	230.1
VSS	132.1	70.1	118.0		70.1	129.9
SETT SOL	0.1	0.2	4.0		0.1	0.5
COLOR	1670.0	980.0	1200.0		830.0	1345.0
PH	8.3	7.5	7.5	8.3	7.6	7.4
NITROGEN	8.1	3.9	3.7			9.0
PHOSPHOR	1.6	0.4	1.1			2.1
DO-CONT.		0.0		2.3		
SS-CONT.						
VSS-CONT						
SET-BOD			97.0			
SLUDGE-SETT						

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 226 IN FILE RECORD 21 DATA FOR 8/14/68

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		33.3	22.2	60.8	54.6	22.2
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		33.3	0.0	0.0	0.0	
D.O.				2.9		
TEMP - C				27.0		
BOD5	188.0	75.0		78.0		81.0
TS	1221.0	1134.0		1289.0		1015.0
VTS	456.8	393.0		458.0		332.9
SS	339.9	304.2		502.0		173.9
VSS	130.0	132.1		230.0		75.9
SETT SOL						
COLOR		1325.0		1750.0		1190.0
PH	8.2	7.4		8.2		7.5
NITROGEN	8.3	4.1		0.1		4.8
PHOSPHOR	0.3	0.2		2.9		0.0
DO-CONT.				2.8		
SS-CONT.						
VSS-CONT						
SET-BOD			81.0			
SLUDGE-SETT						

DAY 227 IN FILE RECORD 22 DATA FOR 8/15/68

	PF	TF1	TF2	AL	OD	CL2
					DELETE	
FEED-GPM		33.3	22.2	60.0	54.0	22.2
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		33.3	0.0	0.0	0.0	
D.O.	4.3	0.0		2.7		
TEMP - C	35.0	33.0	33.0	29.0	29.0	33.0
BOD5	191.0	88.0	165.0	127.0		113.0
TS		1367.9	1501.9	1893.9		1284.9
VTS		467.9	543.8	692.7		448.8
SS		438.2	574.0	1055.9		247.8
VSS		190.1	248.0	479.6		105.8
SETT SOL	0.2	2.3	8.0	34.0		0.8
COLOR	1890.0	1800.0	1860.0	2340.0		1150.0
PH		7.6	7.6			7.8
NITROGEN		0.3	0.0	0.0		0.6
PHOSPHOR		0.6	0.0	0.1		0.3
DO-CONT.		0.0		2.7		
SS-CONT.						
VSS-CONT						
SET-BOD			113.0			
SLUDGE-SETT		130.0				

DAY 228 IN FILE RECORD 23 DATA FOR 8/16/68

	PF	TF1	TF2	AL	OD	CL2
			DELETE			DELETE
FEED-GPM		33.3	22.2	60.8	54.6	22.2
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		33.3	0.0	0.0	0.0	
D.O.	1.5	0.3		2.7		
TEMP - C	35.0	35.0	35.0	31.0	31.0	31.0
BOD5	223.0	129.0	225.0	79.0		170.0
TS	1671.9	1452.0	1678.0	1361.9		1450.0
VTS	701.8	567.0	668.8	471.9		582.0
SS	467.8	411.9	522.1	527.9		386.0
VSS	169.9	155.9	223.9	233.7		169.9
SETT SOL	0.2	1.6	4.0	18.0		0.5
COLOR	2590.0	2055.0	2600.0	1425.0		2050.0
PH	7.6	7.4	7.6	7.7		7.5
NITROGEN	0.0	0.3	0.0	0.0		0.0
PHOSPHOR	1.4	2.2	3.1	2.4		2.2
DO-CONT.		0.3		2.8		
SS-CONT.						
VSS-CONT						
SET-BOD			170.0			
SLUDGE-SETT						

DAY 233 IN FILE RECORD 24 DATA FOR 8/21/68

	PF	TF1	TF2	AL	OD	CL2
					DELETE	
FEED-GPM		42.0	43.5	60.0	52.9	44.4
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		44.0	0.0	0.0	0.0	
D.O.	3.5		3.5	1.6		
TEMP - C	41.0	38.5		32.0	31.0	
BOD5	174.0	95.0	95.0	104.0	60.0	55.0
TS	1430.9	1134.9	1133.0	1873.0	1290.0	970.0
VTS	516.0	408.0	389.9	693.0	494.9	340.9
SS	472.1	292.0	321.9	906.0	351.8	270.9
VSS	173.9	187.9	197.7	465.9	209.9	128.0
SETT SOL	17.0	1.5		30.0	10.0	0.1
COLOR	1575.0	1200.0	995.0	2490.0	1425.0	1135.0
PH	9.1	7.5	7.4	7.7	7.8	7.4
NITROGEN	4.2	0.6	0.7	0.1	0.0	0.5
PHOSPHOR	11.0	2.9	4.9	1.7	2.6	1.5
DO-CONT.		0.2		1.4	1.6	
SS-CONT.						
VSS-CONT						
SET-BOD			55.0			
SLUDGE-SETT		7.5				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 234 IN FILE RECORD 25 DATA FOR 8/22/68

	PF	TF1	TF2 DELETE	AL	OD	CL2 DELETE
FEED-GPM		44.4	44.4	60.8	52.9	44.4
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		44.4	0.0	0.0	0.0	
D.O.	0.0			1.6		
TEMP - C	41.0	38.0		32.0		
BOD5	213.0	147.0	164.0		90.0	169.0
TS	1468.0	1215.0	1378.9		1612.0	1781.0
VTS	566.9	424.9	517.9		562.9	658.0
SS	446.1	257.8	414.1		759.8	895.9
VSS	115.9	176.0	186.1		369.8	424.1
SETT SOL	0.4	1.1	0.3		25.0	14.0
COLOR	1830.0	1360.0	1490.0		2160.0	1390.0
PH	7.5	7.2	7.2		7.5	
NITROGEN	1.7	0.0	0.0		3.1	
PHOSPHOR	0.7	2.6	0.3		1.9	
DO-CONT.		0.5		1.3	2.0	
SS-CONT.						
VSS-CONT						
SET-BOD			169.0			
SLUDGE-SETT		2.0				

DAY 235 IN FILE RECORD 26 DATA FOR 8/23/68

	PF DELETE	TF1	TF2	AL	OD	CL2
FEED-GPM		43.0	44.0	60.0	52.9	44.4
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		44.0	0.0	0.0	0.0	
D.O.	0.0			1.0		
TEMP - C	41.0			32.0		
BOD5	129.0	105.0	126.0	59.0	53.0	123.0
TS	1532.1	1430.0	1510.0	1407.0	1464.9	1629.0
VTS	562.9	559.0	568.9	540.8	515.9	618.8
SS	366.2	267.9	350.0	374.1	393.9	450.1
VSS	222.1	177.9	212.0	235.8	245.9	227.9
SETT SOL	1.5	2.0	3.0	8.0	12.0	5.0
COLOR	1670.0	1250.0	1350.0	1190.0	1270.0	1700.0
PH	8.5	7.7	7.8	7.8	7.8	7.7
NITROGEN	8.4	9.0	5.0	2.8	3.4	4.5
PHOSPHOR	0.3	1.6	1.3	0.7	9.0	2.9
DO-CONT.				0.4	0.9	
SS-CONT.						
VSS-CONT						
SET-BOD			123.0			
SLUDGE-SETT		31.0				

DAY 238 IN FILE RECORD 27 DATA FOR 8/26/68

	PF	TF1	TF2 DELETE	AL	OD	CL2 DELETE
FEED-GPM		44.4	44.4	58.0	50.0	44.4
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		44.4	0.0	0.0	0.0	
D.O.	1.4		1.4	2.3		
TEMP - C	39.0	33.0	33.0	29.0		
BOD5	235.0	163.0	187.0	94.0	121.0	139.0
TS	1564.9	1546.9	1569.0	1656.9	1615.0	1455.0
VTS	703.9	626.9	681.9	727.8	642.7	570.9
SS	420.2	468.1	453.7	818.1	632.0	426.0
VSS	162.0	218.1	211.7	422.0	284.0	196.2
SETT SOL	0.8	2.0	2.8	19.0	23.0	5.0
COLOR	2010.0	2100.0	1800.0	2205.0	2050.0	1890.0
PH	8.4	7.3	7.4	7.5	7.6	7.5
NITROGEN	0.0	0.0	0.0	1.4	2.8	5.6
PHOSPHOR	2.9	2.5	2.5	2.8	3.0	0.1
DO-CONT.		0.3		1.9	1.6	
SS-CONT.						
VSS-CONT						
SET-BOD			139.0			
SLUDGE-SETT		16.0				

DAY 241 IN FILE RECORD 28 DATA FOR 8/29/68

	PF	TF1	TF2 DELETE	AL	OD DELETE	CL2 DELETE
FEED-GPM		44.0	44.0	60.0	52.0	44.4
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		44.4	0.0	0.0	0.0	
D.O.	4.9			3.8		
TEMP - C	35.0	31.0		25.0		
BOD5	152.0	69.0	143.0	44.0	79.0	
TS	1380.0	1382.9	1685.0	1469.0	1470.0	
VTS	647.9	691.8	812.0	792.9	695.0	
SS	315.0	231.0	460.0	265.0	311.8	
VSS	135.0	122.9	203.0	131.9	149.9	
SETT SOL	0.0	0.4	1.8	2.0	9.0	
COLOR	1770.0	1220.0	1770.0	1000.0	1090.0	
PH	8.8	7.6	7.6	7.6	7.6	
NITROGEN	7.8	4.2	5.6	1.4	2.8	
PHOSPHOR	3.0	1.2	1.7	1.5	1.6	
DO-CONT.		1.0		3.5	2.8	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT		0.4				

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DAY 248 IN FILE RECORD 29 DATA FOR 9/ 5/68

	PF	TF1	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.0	67.0	50.0	
DEPTH-FT		24.0	24.0	6.7	7.0	
RECY-GPM		44.4	0.0	0.0	0.0	
D.O.	3.3			2.0		
TEMP - C	36.0	34.0		28.0		
BOD5	176.0	81.0	140.0	144.0	165.0	
TS	1247.1	1067.9	1242.0	1210.9	1345.0	
VTS	490.9	350.9	479.9	422.8	504.9	
SS	296.0	176.0	306.0	419.9	484.0	
VSS	168.1	119.9	191.9	237.7	256.0	
SETT SOL	13.0	0.3	5.0	23.0	17.0	
COLOR	1150.0	650.0	910.0	800.0	950.0	
PH	8.5	7.8	7.9	7.8	7.8	
NITROGEN	0.3	3.0	4.1	0.6	0.6	
PHOSPHOR	0.7	0.9	1.3	2.0	1.6	
DO-CONT.		0.5		1.8	3.2	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT		3.0				

DAY 259 IN FILE RECORD 30 DATA FOR 9/16/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		13.0	33.0	29.0	54.6	100.0
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		7.0	53.0	0.0	60.0	
D.O.	1.1			5.3		
TEMP - C	42.0	28.0	31.0	25.0	32.0	
BOD5	203.0	34.0	108.0	39.0	44.0	38.0
TS		1116.9	1206.0	1154.9	1190.9	1080.9
VTS		469.8	496.0	419.8	528.7	483.9
SS		124.2	191.9	207.8	118.1	83.9
VSS		68.0	95.8	99.7	66.2	49.7
SETT SOL	0.0	0.0	5.0	4.5	2.0	0.5
COLOR		975.0	900.0	890.0	735.0	700.0
PH		7.5	7.5	7.7	7.7	7.6
NITROGEN		2.0	4.5	1.1	0.0	0.0
PHOSPHOR		2.4	1.9	2.5	1.3	1.8
DO-CONT.		1.5		5.5	4.2	
SS-CONT.						
VSS-CONT						
SET-BOD					38.0	
SLUDGE-SETT		2.5				

DAY 261 IN FILE RECORD 31 DATA FOR 9/18/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		11.1	22.2	30.3	109.4	109.4
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.2	0.0	60.0	
D.O.				6.0		
TEMP - C				24.0	34.0	
BOD5	180.0	22.0	112.0	42.0	72.0	70.0
TS	1390.9	1053.0	1400.9	1175.0	1330.0	990.9
VTS	526.7	335.9	475.8	380.0	462.9	288.9
SS	491.9	252.0	629.8	1413.8	574.0	209.9
VSS	212.0	126.0	293.8	1217.9	256.0	113.8
SETT SOL	0.5	3.0	7.0	30.0	26.0	0.2
COLOR		800.0	1700.0	1000.0	1370.0	600.0
PH		7.7	7.5	7.8	7.6	7.6
NITROGEN		5.2	5.0	0.5	0.0	0.1
PHOSPHOR		2.1	2.4	2.5	2.7	1.1
DO-CONT.					2.5	
SS-CONT.						
VSS-CONT						
SET-BOD			35.0		70.0	
SLUDGE-SETT						

DAY 262 IN FILE RECORD 32 DATA FOR 9/19/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		11.1	22.2	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.2	0.0		
D.O.				6.8		
TEMP - C		27.0		23.0		
BOD5						
TS	1304.0	1010.9	1420.9	1311.0		
VTS	406.8	280.9	415.9	395.0		
SS	455.9	219.7	589.9	549.9		
VSS	140.0	73.8	213.8	231.9		
SETT SOL	0.1	0.2	7.0	34.0		
COLOR	2050.0	725.0	1850.0	1225.0		
PH		7.7	7.4	7.7		
NITROGEN		6.4	0.7	0.5		
PHOSPHOR		2.0	2.7	3.3		
DO-CONT.		0.0		6.0		
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 266 IN FILE RECORD 33 DATA FOR 9/23/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		11.1	28.0	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.0	0.0		
D.O.						
TEMP - C						
BOD5	175.0	37.0	122.0	79.0		
TS	1042.9	868.9	1107.0	1304.9		
VTS	341.8	258.0	357.0	444.8		
SS	298.1	124.2	330.2	429.9		
VSS	158.0	94.2	176.0	240.1		
SETT SOL	0.2	0.2	5.0	29.0		
COLOR	1175.0		1020.0			
PH	7.4		7.3			
NITROGEN	0.2	0.6	0.3	0.0		
PHOSPHOR	1.7	1.3	0.8	1.3		
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			85.0			
SLUDGE-SETT		0.3				

DAY 268 IN FILE RECORD 34 DATA FOR 9/25/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		11.1	22.2	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.2	0.0		
D.O.	0.7		6.0	5.0		
TEMP - C	39.5	29.0	33.5	25.0		
BOD5	225.0	72.0	146.0	95.0		
TS	1058.9	885.0	1054.0	1157.9		
VTS	339.9	250.9	317.0	351.9		
SS	148.0	20.1	203.8	411.9		
VSS	35.9		78.1	155.9		
SETT SOL	0.1		7.0	22.0		
COLOR	1300.0	700.0	1025.0	775.0		
PH	7.2	7.4	7.3	7.5		
NITROGEN	0.0	1.7	0.0	1.9		
PHOSPHOR	1.5	0.7	1.0	1.2		
DO-CONT.		0.8		5.5		
SS-CONT.						
VSS-CONT						
SET-BOD			117.0			
SLUDGE-SETT						

DAY 269 IN FILE RECORD 35 DATA FOR 9/26/68

	PF	TF1 DELETE	TF2 DELETE	AL	OD DELETE	CL2 DELETE
FEED-GPM		11.1	22.2	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.2	0.0		
D.O.				6.4		
TEMP - C						
BOD5	171.0	131.0	56.0	94.0		
TS	1130.9	1184.9	1008.9	1216.1		
VTS	347.8	354.9	285.9	384.0		
SS	317.9	329.8	145.8	449.8		
VSS	140.0	158.0	79.9	230.0		
SETT SOL	1.5	9.0	1.5	27.0		
COLOR	1100.0	850.0	650.0	1000.0		
PH	9.1	7.6	7.4	7.3		
NITROGEN	11.4	3.6	4.1	0.1		
PHOSPHOR	1.6	1.9	1.4	2.2		
DO-CONT.				7.0		
SS-CONT.						
VSS-CONT						
SET-BOD			61.0			
SLUDGE-SETT						

DAY 273 IN FILE RECORD 36 DATA FOR 9/30/68

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		11.1	22.2	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.2	0.0		
D.O.	5.3			7.5		
TEMP - C	39.0	24.0		20.0		
BOD5	191.0	24.0	104.0	72.0		
TS	1183.0	913.0	1044.0	1329.0		
VTS	582.9	269.9	323.0	490.9		
SS	401.9	104.0	247.8	563.9		
VSS	259.9		213.9	351.8		
SETT SOL	0.5	0.8	7.5	34.0		
COLOR	1285.0	560.0	1200.0	1225.0		
PH	7.6	7.4	7.3	7.5		
NITROGEN	6.3	3.3	3.1	0.2		
PHOSPHOR	2.5	1.0	1.8	3.3		
DO-CONT.		4.0		7.5		
SS-CONT.						
VSS-CONT						
SET-BOD			77.0			
SLUDGE-SETT						

SHEET 10

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 275 IN FILE RECORD 37 DATA FOR 10/ 2/68

	PF	TF1	TF2	AL	OD	CL2
		DELETE	DELETE		DELETE	DELETE
FEED-GPM		11.1	22.2	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.2	0.0		
D.O.	5.5		6.5	6.6		
TEMP - C	38.0	25.0	32.0	21.0		
BOD5	209.0	21.0	99.0	45.0		
TS	1445.0	995.0	1192.0	1359.1		
VTS	484.9	265.8	353.0	438.0		
SS	632.0	186.1	378.1	382.0		
VSS	245.9	90.0	169.9	177.8		
SETT SOL	5.5		0.3	32.0		
COLOR	1800.0	575.0	900.0	950.0		
PH		7.5	7.4	7.7		
NITROGEN	11.1	3.8	7.6	0.7		
PHOSPHOR	2.2	1.6	1.5	2.2		
DO-CONT.		4.5		6.8		
SS-CONT.						
VSS-CONT						
SET-BOD			82.0			
SLUDGE-SETT		1.5				

DAY 276 IN FILE RECORD 38 DATA FOR 10/ 3/68

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		11.1	22.2	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.2	0.0		
D.O.	4.9		4.6			
TEMP - C	36.5	28.0	33.5			
BOD5	249.0	48.0	153.0	77.0		
TS	1410.9	1026.0	1325.0	1359.1		
VTS	443.8	270.0	427.9	419.9		
SS	487.9	195.9	491.9			
VSS	181.8	92.1	221.8			
SETT SOL	0.8	0.5	7.0	31.0		
COLOR	1925.0	950.0	1375.0	1420.0		
PH	8.3	7.6	7.4	7.6		
NITROGEN	9.6	5.6	5.6	0.6		
PHOSPHOR	2.4	1.6	2.3	2.9		
DO-CONT.		0.4		5.4		
SS-CONT.						
VSS-CONT						
SET-BOD			84.0			
SLUDGE-SETT						

DAY 277 IN FILE RECORD 39 DATA FOR 10/ 4/68

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		11.1	22.2	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		11.1	22.2	0.0		
D.O.	4.6		6.3	7.4		
TEMP - C	35.5	21.0	29.0	19.0		
BOD5	242.0	54.0	177.0	144.0		
TS	1609.9	1035.0	1411.8	1374.9		
VTS	476.8	267.8	397.8	424.8		
SS	656.1	36.0	530.0			
VSS	183.9	14.0	217.8			
SETT SOL	2.0			32.0		
COLOR	2300.0	975.0	1175.0	1350.0		
PH	8.7	7.5	7.7	7.5		
NITROGEN	8.3	6.4		1.4		
PHOSPHOR	1.2	1.3		2.3		
DO-CONT.		0.7		7.0		
SS-CONT.						
VSS-CONT						
SET-BOD			23.0			
SLUDGE-SETT						

DAY 282 IN FILE RECORD 40 DATA FOR 10/ 9/68

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		22.2	14.8	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		22.2	29.6	0.0		
D.O.	6.8		5.5	6.8		
TEMP - C	35.0	26.0	29.5	18.0		
BOD5	168.0	52.0	76.0	172.0		
TS	1019.8	975.9	1016.0	1837.0		
VTS	306.9	267.3	294.6	630.0		
SS	270.0	132.1	299.9	1059.8		
VSS	127.9	82.0	159.8	491.7		
SETT SOL	0.2	1.2	1.5	5.5		
COLOR	1200.0	825.0	825.0	2125.0		
PH	8.2	7.4	7.4	7.4		
NITROGEN	8.5	5.7	5.5	1.6		
PHOSPHOR	3.7	1.1	2.9	5.4		
DO-CONT.		0.2		6.5		
SS-CONT.						
VSS-CONT						
SET-BOD			63.0			
SLUDGE-SETT						

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 283 IN FILE RECORD 41 DATA FOR 10/10/68

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	14.8	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		22.2	29.6	0.0		
D.O.				5.5		
TEMP - C				21.0		
BOD5		40.0	92.0	127.0		
TS		937.9	1082.0	1298.9		
VTS		220.8	288.8	392.9		
SS		177.9	288.0	516.0		
VSS		61.9	115.9	205.9		
SETT SOL		3.0	8.0	26.0		
COLOR		600.0	775.0	1200.0		
PH		7.6	7.2	8.2		
NITROGEN		5.8	5.3	0.3		
PHOSPHOR		1.4	2.0	2.2		
DO-CONT.				5.6		
SS-CONT.						
VSS-CONT						
SET-BOD			60.0			
SLUDGE-SETT		166.0				

DAY 284 IN FILE RECORD 42 DATA FOR 10/11/68

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		22.2	14.8	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		22.2	29.6	0.0		
D.O.	5.0		5.3	6.4		
TEMP - C	36.0	27.0	30.0	19.0		
BOD5	186.0	48.0	109.0	93.0		
TS	1208.9	1067.9	1243.8	1275.0		
VTS	418.9	329.9	425.9	423.9		
SS	386.0	299.9	462.0	462.0		
VSS	202.0	177.8	245.9	251.7		
SETT SOL	0.2	1.4	6.0	21.0		
COLOR	1600.0	1050.0	1300.0	1175.0		
PH	7.7	7.6	7.6	7.9		
NITROGEN	0.2	7.2	5.2	1.6		
PHOSPHOR	0.5	1.9	2.4	3.6		
DO-CONT.		0.3		6.4		
SS-CONT.						
VSS-CONT						
SET-BOD			56.0			
SLUDGE-SETT		237.0				

DAY 287 IN FILE RECORD 43 DATA FOR 10/14/68

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	14.8	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		22.2	29.6	0.0		
D.O.	5.0	0.0	6.1	5.4		
TEMP - C		32.0	34.0	24.0		
BOD5	203.0	74.0	142.0	88.0		
TS		1105.9	1317.9	1318.9		
VTS		305.0	395.8	397.9		
SS	390.0	283.8	440.0			
VSS	126.0	97.9	169.9			
SETT SOL	0.4	5.5	9.0	23.0		
COLOR		950.0	1500.0	1500.0		
PH		7.8	7.5	7.6		
NITROGEN	7.6	5.2	4.2	1.3		
PHOSPHOR	2.2	1.4	2.4	1.2		
DO-CONT.		0.3		4.8		
SS-CONT.						
VSS-CONT						
SET-BOD			97.0			
SLUDGE-SETT		256.0				

DAY 289 IN FILE RECORD 44 DATA FOR 10/16/68

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		22.2	14.8	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		22.2	29.6	0.0		
D.O.	5.9	0.3	6.5	5.3		
TEMP - C	38.0	32.0	33.0	24.0		
BOD5	158.0	56.0	88.0	148.0		
TS	1315.9	1069.0				
VTS	417.9	304.9				
SS	408.0	198.0	235.9	531.9		
VSS	151.9	90.0	111.9	227.9		
SETT SOL	1.0	3.0	6.0	38.0		
COLOR	1550.0	725.0	750.0	1475.0		
PH	7.5	7.5	7.4	7.7		
NITROGEN	0.2	3.0	1.3	1.5		
PHOSPHOR	0.4	1.5	1.1	2.1		
DO-CONT.		0.1		5.1		
SS-CONT.						
VSS-CONT						
SET-BOD			80.0			
SLUDGE-SETT		250.0				

SHEET 11

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 290 IN FILE RECORD 45 DATA FOR 10/17/68

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	14.8	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		22.2	29.6	0.0		
D.O.	5.9	0.3	5.6	5.5		
TEMP - C	34.0	31.0	31.0	24.0		
BOD5	201.0	65.0	91.0	100.0		
TS	1430.0	1135.1	1250.0	1398.0		
VTS	537.6	398.0	462.0	509.9		
SS	541.9	260.0	390.0	377.8		
VSS	235.8	140.0	213.9	235.8		
SETT SOL	4.5	1.0	7.0	42.0		
COLOR	2200.0	1050.0	1225.0	1550.0		
PH	7.5	7.5	7.4	7.7		
NITROGEN	8.7	4.5	3.7	0.2		
PHOSPHOR	0.9	1.8	1.6	2.0		
DO-CONT.		0.3		5.4		
SS-CONT.						
VSS-CONT						
SET-BOD			47.0			
SLUDGE-SETT		210.0				

DAY 291 IN FILE RECORD 46 DATA FOR 10/18/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	14.8	30.3		
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		22.2	29.6	0.0		
D.O.				4.2		
TEMP - C		33.0		25.0		
BOD5	309.0	110.0	168.0	95.0		
TS	1725.0	1286.9	1716.0	1490.0		
VTS	716.9	448.8	634.9	523.8		
SS	459.8	365.9	667.7	640.2		
VSS	209.9	155.9	311.8	302.0		
SETT SOL		2.5	10.0	54.0		
COLOR		1700.0	2400.0	1880.0		
PH	0.0	7.5	7.6	7.7		
NITROGEN	100.4	3.7	0.8	1.1		
PHOSPHOR	2.0	2.2	2.1	2.1		
DO-CONT.		1.5		3.8		
SS-CONT.						
VSS-CONT						
SET-BOD			98.0			
SLUDGE-SETT						

DAY 294 IN FILE RECORD 47 DATA FOR 10/21/68

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM			14.8	30.3		
DEPTH-FT			16.0	6.7	7.0	
RECY-GPM			19.6	0.0		
D.O.				8.1		
TEMP - C				19.0		
BOD5	209.0		115.0	148.0		
TS	1393.1		1308.8	1423.0		
VTS	458.0		434.8	483.9		
SS	382.0		400.0	579.8		
VSS	169.9		231.9	353.9		
SETT SOL	1.0		9.0	40.0		
COLOR	1925.0		1425.0	1550.0		
PH	8.9					
NITROGEN	0.1					
PHOSPHOR	0.9					
DO-CONT.				6.2		
SS-CONT.						
VSS-CONT						
SET-BOD			47.0			
SLUDGE-SETT						

DAY 297 IN FILE RECORD 48 DATA FOR 10/24/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	14.8	42.6	109.4	
DEPTH-FT		24.0	16.0	6.7	7.0	
RECY-GPM		22.2	29.6	0.0	60.0	
D.O.	4.6	0.5	1.8	3.6		
TEMP - C	37.0	30.0	32.0	22.0	28.0	
BOD5	203.0	106.0	153.0	123.0		
TS	1138.0	1179.9	1305.0	1500.0		
VTS	358.8	357.8	405.0	615.9		
SS	270.0	359.8	486.1	708.0		
VSS	126.0	143.7	198.0	325.8		
SETT SOL	0.5	9.0	40.0	2.5		
COLOR	1000.0	1175.0	1250.0	1450.0		
PH	7.2	7.2	7.3	7.4		
NITROGEN	7.4	5.9	3.4	1.1		
PHOSPHOR	1.6	1.2	1.1	1.8		
DO-CONT.		0.2		3.3	2.6	
SS-CONT.						
VSS-CONT						
SET-BOD			98.0			
SLUDGE-SETT		125.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 298 IN FILE RECORD 49 DATA FOR 10/25/68

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2		42.6	109.4	
DEPTH-FT		24.0		6.7	7.0	
RECY-GPM		22.2		0.0	60.0	
D.O.				5.1		
TEMP - C		30.0		20.0	26.0	
BOD5	227.0	99.0		151.0		
TS	1392.0	1231.9		1506.0		
VTS	549.9	427.0		554.8		
SS	486.1	455.9		747.9		
VSS	266.0	249.8		419.9		
SETT SOL	1.5	3.0		40.0		
COLOR	1700.0	1250.0		1375.0		
PH	8.1	7.6		7.4		
NITROGEN	2.8	3.7		6.2		
PHOSPHOR	0.8	1.2		1.3		
DO-CONT.		0.0		5.0	4.8	
SS-CONT.						
VSS-CONT						
SET-BOD						
SLUDGE-SETT						

DAY 308 IN FILE RECORD 50 DATA FOR 11/ 4/68

	PF DELETE	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		29.6	14.8	40.6		
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0		
D.O.	4.8	0.1	3.9	5.4		
TEMP - C	38.0	28.0		20.0		
BOD5	281.0	137.0	108.0	196.0		
TS	1465.9	1145.0		1315.0		
VTS	650.8	430.9		462.8		
SS	559.9	260.0	339.9	516.0		
VSS	240.1	126.0	163.8	245.9		
SETT SOL	0.4	0.1	2.0	12.0		
COLOR	2475.0	1650.0	1600.0	1350.0		
PH	8.2	7.4	7.6	7.6		
NITROGEN	5.5	6.2	4.5	1.9		
PHOSPHOR	2.4	1.3	1.7	2.4		
DO-CONT.				5.4		
SS-CONT.						
VSS-CONT						
SET-BOD			93.0			
SLUDGE-SETT						

DAY 310 IN FILE RECORD 51 DATA FOR 11/ 6/68

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		29.6	14.8	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0	60.0	
D.O.				8.8		
TEMP - C				20.0	26.0	
BOD5	227.0	155.0	156.0	99.0	24.0	11.0
TS	1582.0	1454.0	1510.9	1293.9	988.0	914.0
VTS	537.8	655.0	540.0	421.8	257.0	217.5
SS	692.1	444.0	494.0	409.8	121.7	43.9
VSS	334.1	275.8	332.0	263.9		
SETT SOL	0.1	0.1	0.4	10.0	12.0	0.0
COLOR	2475.0	2600.0	1925.0	1250.0	575.0	450.0
PH	8.3	7.6	7.8	7.7	7.8	7.7
NITROGEN	21.4	6.0	2.3	2.0	0.8	0.3
PHOSPHOR	3.9	3.6	2.8	1.1	1.0	0.7
DO-CONT.				7.9		
SS-CONT.						
VSS-CONT						
SET-BOD			93.0		11.0	
SLUDGE-SETT		950.0				

DAY 311 IN FILE RECORD 52 DATA FOR 11/ 7/68

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		29.6	14.8	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0	60.0	
D.O.				6.2		
TEMP - C				21.0	27.0	
BOD5	181.0	93.0	76.0	120.0		37.0
TS	1101.0	953.9	953.0	1171.1	1677.8	895.9
VTS	367.9	296.0	297.0	378.9	628.8	235.1
SS	319.8	169.9	196.2	351.8	881.9	96.1
VSS	127.8	87.8	106.1	169.9	422.0	61.9
SETT SOL	0.5	0.5	3.5	7.0		0.5
COLOR	1500.0	900.0	775.0	1025.0	2050.0	650.0
PH	8.3	7.2	7.3	7.4	7.3	7.9
NITROGEN	11.5	7.0	7.2	1.6		0.5
PHOSPHOR	2.6	2.1	1.4	2.6		0.9
DO-CONT.				6.2		
SS-CONT.						
VSS-CONT						
SET-BOD			46.0		37.0	
SLUDGE-SETT						

TABLE 14

SHEET 14

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 312 IN FILE RECORD 53 DATA FOR 11/ 8/68

	PF	TF1	TF2	AL	OD	CL2
					DELETE	DELETE
FEED-GPM		29.6	14.8	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0	60.0	
D.O.	6.2		5.0	6.6		
TEMP - C	35.0	24.0	24.0	19.0	23.0	
BOD5	229.0	93.0	129.0	127.0		30.0
TS	1299.1	0.0	1096.0	1195.9	1759.0	908.0
VTS	435.9	0.0	335.9	395.8	619.0	242.4
SS	383.9	184.0	245.9	366.2	957.9	86.0
VSS	53.9	14.0	51.8	108.0	375.8	
SETT SOL	0.5	0.2	3.0	16.0		0.7
COLOR	2600.0	1750.0	1750.0	1300.0	2550.0	1025.0
PH	8.6	7.2	7.4	7.5	7.3	7.8
NITROGEN	12.5	7.7	6.2	1.4		0.0
PHOSPHOR	3.0	2.4	1.9	2.3		0.7
DO-CONT.		0.6		6.7		
SS-CONT.						
VSS-CONT						
SET-BOD			70.0		30.0	
SLUDGE-SETT						

DAY 315 IN FILE RECORD 54 DATA FOR 11/11/68

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		29.6	14.8	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0	60.0	
D.O.	7.9		6.1	7.1		
TEMP - C	36.0	21.0	26.0	16.0	25.0	
BOD5	223.0	165.0	172.0	125.0		45.0
TS	1669.0	1334.9	1321.1	1497.0	1781.0	1217.0
VTS	850.0	572.0	477.9	465.8	633.8	348.9
SS	729.9	372.0	495.9	540.1	693.9	242.0
VSS	281.9	147.9	191.9	222.1	331.9	132.1
SETT SOL	7.9	0.4	6.0	17.0	30.0	22.0
COLOR	2600.0	1750.0	1400.0	1200.0	1650.0	775.0
PH	9.0	9.2	8.4	7.7	7.3	7.5
NITROGEN	10.0	7.7	8.9	1.9		0.8
PHOSPHOR	2.0	0.3	1.7	2.0		1.4
DO-CONT.		4.9		7.1		
SS-CONT.						
VSS-CONT						
SET-BOD			93.0		45.0	
SLUDGE-SETT						

DAY 317 IN FILE RECORD 55 DATA FOR 11/13/68

	PF	TF1	TF2	AL	OD	CL2
					DELETE	DELETE
FEED-GPM		29.6	14.8	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0	60.0	
D.O.	5.9		4.5	6.9		
TEMP - C	36.0	21.0	24.0	16.0	21.0	
BOD5	185.0	87.0	136.0	121.0		21.0
TS	1282.0	1123.0	1407.0	1312.0	2145.9	964.9
VTS	492.0	427.9	573.0	495.9	814.8	285.9
SS	284.1	335.9	700.0	588.0	1248.1	171.8
VSS	205.9	209.9	369.8	323.7	595.9	107.7
SETT SOL	0.5	0.5	30.0	23.0	100.0	0.7
COLOR	1700.0	1250.0	1550.0	1185.0	2000.0	350.0
PH	8.1	6.9	7.1	7.2	7.1	7.2
NITROGEN	9.4	4.3	5.9	0.8		0.5
PHOSPHOR	1.0	0.9	2.5	1.8		0.5
DO-CONT.		1.1		6.6		
SS-CONT.						
VSS-CONT						
SET-BOD			72.0		21.0	
SLUDGE-SETT						100.0

DAY 318 IN FILE RECORD 56 DATA FOR 11/14/68

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		29.6	14.8	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0	60.0	
D.O.	6.4			6.8		
TEMP - C	36.0	20.0		15.0	22.0	
BOD5	233.0	93.0	120.0	209.0		11.0
TS	1419.0	1138.9	1269.0	1622.0	945.1	894.0
VTS	667.9	424.9	502.5	642.9	344.0	313.7
SS	390.0	242.0	321.9	812.0	127.8	90.0
VSS	222.1	159.8	204.1	508.1	101.9	
SETT SOL	1.0	0.3	0.5	30.0		0.3
COLOR	1900.0	1300.0	1500.0	1700.0	4000.0	350.0
PH		7.4	7.5	7.4	7.2	7.5
NITROGEN	12.9	6.0	9.7	1.1		1.2
PHOSPHOR	1.4	0.7	1.0	1.3		0.5
DO-CONT.		2.4		6.9		
SS-CONT.						
VSS-CONT						
SET-BOD			94.0		11.0	
SLUDGE-SETT						70.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 319 IN FILE RECORD 57 DATA FOR 11/15/68

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		29.6	14.8	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0	60.0	
D.O.	5.4		4.5	5.6		
TEMP - C	36.0	24.0	28.0	17.0	23.0	
BOD5	234.0	98.0	158.0	195.0		15.0
TS	1484.0	1212.0	1647.9	1618.9	2138.0	935.0
VTS	629.9	425.0	593.7	569.8	917.8	250.9
SS	587.7	302.1	782.1	737.9	1273.8	111.9
VSS	185.7	110.1	313.9	301.8	541.8	27.7
SETT SOL	1.0		16.0	40.0	100.0	0.5
COLOR	2500.0	1800.0	2300.0	1700.0	2600.0	500.0
PH	8.6	7.2	7.4	7.5	7.4	7.6
NITROGEN	11.9	5.6	9.5	0.8		0.1
PHOSPHOR	1.9	1.0	1.7	2.3		0.4
DO-CONT.		0.1		5.6	6.2	
SS-CONT.						
VSS-CONT						
SET-BOD			89.0		15.0	
SLUDGE-SETT						

DAY 322 IN FILE RECORD 58 DATA FOR 11/18/68

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	29.6	0.0	60.0	
D.O.	5.5		5.0	5.9		
TEMP - C	34.0	24.0	24.0	19.0	24.0	
BOD5	172.0	78.0	132.0	193.0		26.0
TS	1135.0	4723.9	1545.8	1546.0	1757.9	892.0
VTS	445.9	4187.7	570.8	562.7	696.8	302.3
SS	267.9	231.9	852.0	763.8	426.0	109.8
VSS	198.0	187.9	382.0	411.9	255.6	
SETT SOL	1.0	1.5	20.0	55.0	115.0	8.0
COLOR	1175.0	850.0	1500.0	1650.0	2425.0	550.0
PH	8.6	7.2	7.1	7.4	7.3	7.4
NITROGEN	11.5	7.0	8.1	2.0		0.8
PHOSPHOR	1.3	1.4	1.6	1.9		0.7
DO-CONT.		0.6		6.6		
SS-CONT.						
VSS-CONT						
SET-BOD			45.0		26.0	
SLUDGE-SETT						130.0

DAY 324 IN FILE RECORD 59 DATA FOR 11/20/68

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	22.2	0.0	60.0	
D.O.						
TEMP - C						
BOD5	188.0	91.0	138.0	150.0		23.0
TS	1195.9	2458.1	1390.9	1548.0	3963.0	895.0
VTS	382.9	716.0	441.7	510.0	1489.6	226.9
SS	279.8		578.0	718.0	2915.9	140.0
VSS	90.0		227.9	293.8	1143.9	50.0
SETT SOL		0.1	14.0	45.0		0.0
COLOR		1450.0	1350.0	1450.0	7700.0	7700.0
PH	8.7	7.1	7.2	7.2	7.1	7.1
NITROGEN	13.2	7.8	7.1	0.3		0.8
PHOSPHOR	1.7	0.8	2.1	1.6		0.6
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			54.0		23.0	
SLUDGE-SETT						60.0

DAY 325 IN FILE RECORD 60 DATA FOR 11/21/68

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD	CL2
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	22.2	0.0	60.0	
D.O.	6.0			6.9		
TEMP - C	35.0	19.0		14.0	21.0	
BOD5	319.0	129.0	177.0	184.0		18.0
TS	1755.9	1365.9	1716.0	1647.0	3397.0	937.0
VTS	683.9	486.8	655.8	789.9	1391.7	318.9
SS	749.8	455.9	812.0	830.0	2630.0	132.1
VSS	245.9	162.0	307.8	341.7	1131.6	42.1
SETT SOL	0.5	0.5	12.0	60.0	250.0	0.0
COLOR	3500.0	1850.0	2600.0	1700.0	5800.0	
PH	8.7	7.4	7.3	7.2	7.3	
NITROGEN	9.0	3.4	4.2	0.8		0.0
PHOSPHOR	1.1	0.7	0.9	1.6		0.5
DO-CONT.		3.0		7.0	6.4	
SS-CONT.						
VSS-CONT						
SET-BOD			94.0		18.0	
SLUDGE-SETT						200.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 326 IN FILE RECORD 61 DATA FOR 11/22/68

	PF	TF1	TF2	AL	OD	CL2
					DELETE	DELETE
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	22.2	0.0	60.0	
D.O.	1.0	0.0	5.5	6.5		
TEMP - C		21.0	22.0	15.0	23.0	
BODS	227.0	90.0	115.0	177.0		19.0
TS	1549.9	1372.9	1511.9	1768.0	2078.0	
VTS	522.8	361.9	436.9	727.8	1349.9	
SS	393.9	315.8	437.9	773.9	1179.8	
VSS	163.8		204.1	343.9	523.9	
SETT SOL	1.0	1.0	0.2	56.0	116.0	0.0
COLOR	2100.0	1650.0	1800.0	1800.0	1750.0	500.0
PH	7.9	7.1	7.1	7.3	7.1	7.4
NITROGEN	11.1	3.9	5.0	8.2		0.3
PHOSPHOR	1.9	1.5	1.3	1.5		0.3
DO-CONT.		1.4		6.6	4.4	
SS-CONT.						
VSS-CONT						
SET-800			91.0		19.0	
SLUDGE-SETT						150.0

DAY 329 IN FILE RECORD 62 DATA FOR 11/25/68

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE		
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	22.2	0.0	60.0	
D.O.	2.8			7.0		
TEMP - C	35.0	22.0		17.0	24.0	
BODS	220.0	116.0	188.0	154.0		34.0
TS	0.0	1454.0	1679.0	1735.9	2648.0	1172.0
VTS	0.0	432.8	527.8	622.8	1020.0	353.0
SS	494.0	325.9	532.2	785.8	710.1	
VSS	183.9	118.0	234.0	353.9	136.0	
SETT SOL	0.5	6.0	7.0	58.0	126.0	0.3
COLOR	2000.0	1350.0	1750.0	1850.0	7200.0	800.0
PH	8.4	7.3	7.4	7.4	7.3	7.4
NITROGEN	7.0	5.3	4.8	0.8		0.3
PHOSPHOR	1.8	1.3	2.1	1.1		1.4
DO-CONT.		1.5		7.7	3.5	
SS-CONT.						
VSS-CONT						
SET-800					34.0	
SLUDGE-SETT						330.0

DAY 331 IN FILE RECORD 63 DATA FOR 11/27/68

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	22.2	0.0	60.0	
D.O.				6.6		
TEMP - C				17.0	23.0	
BODS	181.0	98.0	225.0	167.0		53.0
TS	1170.0	1125.0	1967.0	1571.9	5233.0	1023.1
VTS	437.0	0.0	711.8	511.9	2021.5	297.9
SS	199.8	97.9	844.1	604.2	4326.1	
VSS	77.8	65.9	370.1	320.0	1671.6	
SETT SOL						
COLOR		1100.0	2125.0	1550.0	9600.0	800.0
PH	7.4	7.2	7.3	7.4	7.3	7.5
NITROGEN	7.3	4.1	17.1	0.6		0.0
PHOSPHOR	4.7	1.5	4.5	3.0		0.7
DO-CONT.		0.1		6.8		
SS-CONT.						
VSS-CONT						
SET-800			134.0		53.0	
SLUDGE-SETT						

DAY 336 IN FILE RECORD 64 DATA FOR 12/ 2/68

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE		
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	22.2	0.0	60.0	
D.O.	6.3	0.1	5.7	7.4		
TEMP - C	35.0	23.0	27.0	16.0	23.0	
BODS	262.0	101.0	178.0	137.0		34.0
TS	1078.9	1408.9	1660.0	1645.9	1838.0	1184.9
VTS	321.9	463.9	635.9	579.8	679.9	339.8
SS	195.9	302.1	1062.0	664.0	755.9	124.2
VSS	83.9	128.1	485.7	299.9	342.0	44.2
SETT SOL	1.0	0.2	21.0		60.0	1.0
COLOR	800.0	1800.0	1900.0	1850.0	2200.0	700.0
PH	7.4	7.2	7.3	7.4	7.4	7.6
NITROGEN	0.7	4.0	5.7	1.0		0.3
PHOSPHOR	0.5	1.6	3.3	2.0		0.6
DO-CONT.		0.1		7.7	5.8	
SS-CONT.						
VSS-CONT						
SET-800			94.0		34.0	
SLUDGE-SETT						

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 338 IN FILE RECORD 65 DATA FOR 12/ 4/68

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		14.8	22.2		109.4	109.4
DEPTH-FT		22.0	24.0		7.0	
RECY-GPM		0.0	22.2		60.0	
D.O.						
TEMP - C						
BOD5	266.0	105.0	156.0	151.0		45.0
TS	1479.9	1339.8	1578.9	1605.0	1559.9	1119.9
VTS	587.8	390.8	510.7	535.9	540.8	321.8
SS	374.1	248.1	599.9	678.1		144.0
VSS	219.9	194.0	415.8	410.1		117.7
SETT SOL	0.5	0.4	65.0		8.0	1.5
COLOR	1800.0	1300.0	1550.0		1670.0	600.0
PH	7.4	7.6	7.5	7.5	7.4	7.5
NITROGEN	12.0	6.9	1.9	1.3		1.0
PHOSPHOR	1.4	1.6	1.0	1.4		0.5
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			30.0		45.0	
SLUDGE-SETT						

DAY 339 IN FILE RECORD 66 DATA FOR 12/ 5/68

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE		
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	22.2	0.0	60.0	
D.O.	1.1		5.6	7.0		
TEMP - C	35.0	18.0	23.0	16.0	23.0	
BOD5	214.0	139.0	122.0	131.0		54.0
TS	1722.8	1396.9	1557.0	1697.0	1824.0	1096.0
VTS	601.7	449.9	465.8	572.9	638.9	461.9
SS	499.8	238.0	504.1	760.1	787.9	142.2
VSS	211.7	146.1	254.1	380.2	303.9	92.1
SETT SOL	0.7	0.2	11.0	50.0	0.2	8.2
COLOR	2550.0	1550.0	1700.0	1700.0		875.0
PH	7.2	7.6	7.5	7.4		7.4
NITROGEN	3.9	8.1	5.2	2.0		1.8
PHOSPHOR	0.8	0.8	1.5	1.6		0.8
DO-CONT.		0.6		7.3	2.5	
SS-CONT.						
VSS-CONT						
SET-BOD			89.0		54.8	
SLUDGE-SETT						

DAY 340 IN FILE RECORD 67 DATA FOR 12/ 6/68

	PF	TF1	TF2	AL	OD	CL2
	DELETE					
FEED-GPM		14.8	22.2	41.0	109.4	109.4
DEPTH-FT		22.0	24.0	6.7	7.0	
RECY-GPM		0.0	22.2	0.0	60.0	
D.O.	5.0	3.0	5.9	7.5		
TEMP - C	33.0	18.0	24.0	13.0	22.0	
BOD5	344.0	123.0	166.0	155.0		53.0
TS	2187.0	1395.1	1876.0	1636.0		1174.0
VTS	810.0	412.9	671.0	526.9		364.8
SS	929.8	243.8	780.0	635.9		87.8
VSS	289.8	75.9	237.9	239.8		33.8
SETT SOL	4.0	0.2	11.0	60.0	45.0	0.1
COLOR	3700.0	1800.0	2400.0	1800.0	2200.0	800.0
PH	7.2	7.5	7.4	7.3	7.4	7.4
NITROGEN	10.0	7.3	6.4	0.0		1.8
PHOSPHOR	1.4	0.5	1.0	1.6		0.5
DO-CONT.				7.5	6.0	
SS-CONT.						
VSS-CONT						
SET-BOD			103.0		53.0	
SLUDGE-SETT						55.0

DAY 413 IN FILE RECORD 68 DATA FOR 2/17/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE			
FEED-GPM		33.3	33.3			
DEPTH-FT		24.0	24.0			
RECY-GPM		33.3	33.3			
D.O.	7.5		4.9			
TEMP - C	30.0	21.0	21.0			
BOD5	256.0	272.0	275.0			
TS	2153.9	1936.0	2283.9			
VTS	609.9	484.9	634.7			
SS	996.0	661.9	611.8			
VSS	302.1	194.0	239.8			
SETT SOL	8.0	1.7	4.0			
COLOR	1800.0	2050.0	2600.0			
PH	7.5	7.4	8.0			
NITROGEN	0.0	2.8	1.4			
PHOSPHOR	2.1	1.4	0.9			
DO-CONT.		0.2				
SS-CONT.						
VSS-CONT						
SET-BOD			218.0			
SLUDGE-SETT						

SHEET 17

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 415 IN FILE RECORD 69 DATA FOR 2/19/69

	PF DELETE	TF1	TF2	AL	OD	CL2
FEED-GPM		33.3	33.3			
DEPTH-FT		24.0	24.0			
RECY-GPM		33.3	33.3			
D.O.	7.1		4.7			
TEMP - C	31.0	25.0	25.0			
BOD5	176.0	122.0	153.0			
TS	1534.1	1564.0	1582.0			
VTS	405.0	286.9	324.9			
SS	223.9	225.8	278.0			
VSS	12.1	39.9	87.8			
SETT SOL	0.2	0.2	3.0			
COLOR	1500.0	1750.0	1500.0			
PH	7.1	6.9	7.1			
NITROGEN	1.7					
PHOSPHOR	2.8					
DO-CONT.		0.3				
SS-CONT.		5864.2				
VSS-CONT		1775.6				
SET-BOD			130.0			
SLUDGE-SETT		175.0				

DAY 416 IN FILE RECORD 70 DATA FOR 2/20/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		33.3	33.3			
DEPTH-FT		24.0	24.0			
RECY-GPM		33.3	33.3			
D.O.	6.3		4.0			
TEMP - C	28.0	23.0	23.0			
BOD5	286.0	189.0	222.0			
TS	1816.1	1659.0	1653.9			
VTS	582.9	414.1	460.9			
SS	363.7	415.9	422.0			
VSS	95.8	257.8	140.0			
SETT SOL	0.2	0.8	5.5			
COLOR	2050.0	1925.0	1800.0			
PH	7.1	7.2	7.4			
NITROGEN	0.0	0.0				
PHOSPHOR	1.4	1.1				
DO-CONT.		1.4				
SS-CONT.		807.8				
VSS-CONT		225.7				
SET-BOD			166.0			
SLUDGE-SETT						

DAY 417 IN FILE RECORD 71 DATA FOR 2/21/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		33.3	33.3			
DEPTH-FT		24.0	24.0			
RECY-GPM		33.3	33.3			
D.O.	2.0		1.8			
TEMP - C	29.0	21.0	21.0			
BOD5	490.0	310.0	376.0			
TS	2900.0	2301.0	2717.1			
VTS	731.6	543.0	683.9			
SS	289.9	552.0	899.9			
VSS	32.0	235.1	352.1			
SETT SOL	0.1	3.0	4.0			
COLOR	4100.0	3400.0	3700.0			
PH	8.1	8.5	8.6			
NITROGEN	5.6		2.8			
PHOSPHOR	2.1		1.5			
DO-CONT.		0.5				
SS-CONT.		9273.9				
VSS-CONT		2515.1				
SET-BOD			346.0			
SLUDGE-SETT		390.0				

DAY 420 IN FILE RECORD 72 DATA FOR 2/24/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		33.3	33.3			
DEPTH-FT		24.0	24.0			
RECY-GPM		33.3	33.3			
D.O.						
TEMP - C		24.0				
BOD5	242.0	145.0	226.0			
TS	1604.0	1542.9	1844.0			
VTS	388.0	307.9	439.9			
SS	559.9	350.0	619.8			
VSS	81.7	79.9	183.7			
SETT SOL	35.0	2.0	7.0			
COLOR	1800.0	1600.0	1800.0			
PH		8.3	7.8			
NITROGEN		2.8				
PHOSPHOR		1.5				
DO-CONT.		0.4				
SS-CONT.		7376.1				
VSS-CONT		2381.7				
SET-BOD			133.0			
SLUDGE-SETT		210.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 422 IN FILE RECORD 73 DATA FOR 2/26/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE			
FEED-GPM		33.3	33.3			
DEPTH-FT		24.0	24.0			
RECY-GPM		33.3	33.3			
D.O.	9.0					
TEMP - C	29.0	21.0				
BOD5	294.0	129.0	142.0			
TS	1916.9	1543.0	1566.0			
VTS	594.8	416.0	451.0			
SS	608.2	415.9	315.8			
VSS	219.9	176.0	140.0			
SETT SOL	6.0	1.2	1.0			
COLOR	2500.0	1600.0	1580.0			
PH	8.2	7.5	7.8			
NITROGEN	1.4		1.4			
PHOSPHOR	2.4		2.0			
DO-CONT.		0.5				
SS-CONT.		10184.0				
VSS-CONT		3717.1				
SET-BOD			152.0			
SLUDGE-SETT		330.0				

DAY 423 IN FILE RECORD 74 DATA FOR 2/27/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE			
FEED-GPM		33.3	33.3			
DEPTH-FT		24.0	24.0			
RECY-GPM		33.3	33.3			
D.O.	9.0		6.1			
TEMP - C	31.0		22.0			
BOD5	202.0	176.0	190.0			
TS	1502.9	1430.0	1513.9			
VTS	521.9	427.8	423.7			
SS	166.0	185.8	57.9			
VSS	46.0	86.0	41.8			
SETT SOL	0.1	0.0	0.0			
COLOR	1600.0	1350.0	1450.0			
PH	7.6	7.3	7.8			
NITROGEN	14.6					
PHOSPHOR	4.2					
DO-CONT.						
SS-CONT.		15895.9				
VSS-CONT		5498.4				
SET-BOD			166.0			
SLUDGE-SETT		650.0				

DAY 424 IN FILE RECORD 75 DATA FOR 2/28/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		33.3	33.3			
DEPTH-FT		24.0	24.0			
RECY-GPM		33.3	33.3			
D.O.	7.1		5.4			
TEMP - C	31.0	23.0	26.0			
BOD5	314.0	226.0	232.0	139.0		
TS	1822.9	1596.9	1612.0			
VTS	559.8	451.9	459.9			
SS	476.0	365.9	386.0			
VSS	172.0	191.9	195.9			
SETT SOL	0.7	0.6	6.5			
COLOR	1800.0	1600.0	1500.0			
PH	7.1	7.2	7.4			
NITROGEN	8.4					
PHOSPHOR	1.8					
DO-CONT.		1.0				
SS-CONT.		9272.1				
VSS-CONT		3479.8				
SET-BOD			175.0			
SLUDGE-SETT		220.0				

DAY 427 IN FILE RECORD 76 DATA FOR 3/ 3/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE			
FEED-GPM		33.3	33.3	24.4	62.5	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		33.3	33.3	0.0	62.5	
D.O.	6.6			6.6	0.6	
TEMP - C	33.0	22.0		13.0	23.0	
BOD5	332.0	133.0	178.0	79.0		
TS	2094.8	1414.9	1679.9	1593.9		1587.9
VTS	864.9	444.8	760.0	500.8		557.8
SS	737.9	185.8	494.0	396.1	563.9	274.0
VSS	338.1	75.9	218.1	180.0	263.9	114.1
SETT SOL	17.0	0.3	7.0	1.8	0.5	0.4
COLOR	1900.0	1250.0	1550.0	1500.0	1700.0	1600.0
PH	7.1	7.6	7.3	7.5	7.2	7.3
NITROGEN	7.0					
PHOSPHOR	3.2					
DO-CONT.		1.7		6.8	1.2	
SS-CONT.		17510.0				
VSS-CONT		7898.7				
SET-BOD			124.0	52.0		
SLUDGE-SETT		750.0				10.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 429 IN FILE RECORD 77 DATA FOR 3/ 5/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		33.3	33.3	24.4	62.5	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		33.3	33.3	0.0	60.0	
D.O.	5.9		1.0	6.5	1.0	
TEMP - C	35.0		24.0	13.0	23.0	
BOD5	339.0	222.0	201.0	62.0		64.0
TS	2050.0	1808.0	2080.0	1407.0		1652.0
VTS	842.9	649.9	1139.8	399.8		545.0
SS	563.9	297.8	539.8	141.9	355.8	150.1
VSS	262.1	167.8	289.8	97.9	235.8	97.9
SETT SOL	0.4	0.4	1.5	0.2	0.2	0.1
COLOR	2900.0	2300.0	2750.0	1200.0	1900.0	1850.0
PH	8.1		7.8	7.4	7.3	7.3
NITROGEN	8.4		5.0			
PHOSPHOR	2.3		2.5			
DO-CONT.				6.5	1.5	
SS-CONT.		2099.9				
VSS-CONT		985.9				
SET-BOD			137.0	51.0	64.0	
SLUDGE-SETT		120.0				40.0

DAY 430 IN FILE RECORD 78 DATA FOR 3/ 6/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		33.3	33.3	24.4	62.5	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		33.3	33.3	0.0	60.0	
D.O.	4.0		3.9	6.5	0.6	
TEMP - C	34.0	24.0	28.0	14.0	24.0	
BOD5	227.0	102.0	147.0	55.0		93.0
TS	1641.9	1417.9	1625.0	1430.0		1563.1
VTS	639.8	399.8	510.9	405.9		475.9
SS	278.0	169.9	469.9	216.0	269.7	351.8
VSS	104.0	73.8	210.0	110.1	145.8	195.9
SETT SOL	0.3	0.2	2.3	0.3	0.5	0.3
COLOR	1850.0	1700.0	1800.0	1200.0	1800.0	1800.0
PH	7.2	7.0	7.2	7.3	7.1	7.0
NITROGEN	11.2			1.4		
PHOSPHOR	2.8			1.8		
DO-CONT.		0.5		6.2	1.)	
SS-CONT.		5989.9				834.0
VSS-CONT		2531.9				349.9
SET-BOD			129.0	48.0	93.0	
SLUDGE-SETT		110.0				30.0

DAY 431 IN FILE RECORD 79 DATA FOR 3/ 7/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		33.3	33.3	24.4	62.5	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		33.3	33.3	0.0	60.0	
D.O.	5.5		5.4	6.5	0.7	
TEMP - C	32.0	22.0	27.0	14.0	23.0	
BOD5	261.0	174.0	168.0	53.0		61.0
TS	1602.9	1602.0	1660.0	1439.9		1574.9
VTS	719.8	631.9	613.8	515.9		617.8
SS	280.1	409.8	419.9	235.9	808.1	680.2
VSS	122.0	202.0	208.1	127.8	374.0	326.1
SETT SOL	0.5	2.0	3.5	0.5	2.0	1.5
COLOR	1900.0	2200.0	1900.0	1100.0	2000.0	2000.0
PH	7.4	7.2	7.3	7.5	7.4	7.2
NITROGEN	14.0					2.8
PHOSPHOR	3.2					1.4
DO-CONT.		0.6		6.7	0.9	
SS-CONT.		13582.1				1016.2
VSS-CONT		6501.7				428.1
SET-BOD			125.0	42.0	61.0	
SLUDGE-SETT		770.0				32.0

DAY 434 IN FILE RECORD 80 DATA FOR 3/10/69

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	82.0	
D.O.	8.3		4.3	5.1	0.5	
TEMP - C	31.0	22.0	24.0	15.0	22.0	
BOD5	309.0	186.0	237.0	73.0		35.0
TS	1855.9	1560.9	1797.9	1374.0		1501.9
VTS	704.8	470.9	550.8	353.9		460.9
SS	455.9	253.9	387.8	106.2	307.9	184.0
VSS	127.8	93.9	166.0	26.2	163.8	95.8
SETT SOL	0.2	12.0	5.0	0.2	0.1	0.1
COLOR	2200.0	1800.0	1850.0	1000.0	1600.0	1700.0
PH	7.5	7.2			6.9	7.2
NITROGEN	9.0	2.2				
PHOSPHOR	3.0	2.0				
DO-CONT.		0.0		5.5	0.9	
SS-CONT.						354.0
VSS-CONT						187.9
SET-BOD			151.0	51.0	35.0	
SLUDGE-SETT		30.0				20.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 436 IN FILE RECORD 81 DATA FOR 3/12/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	60.0	
D.O.	4.0			6.9		
TEMP - C	32.0	25.0		12.0	20.0	
BOD5	287.0	130.0	184.0	48.0		89.0
TS	1938.0	1479.9	1856.9	1383.9		1601.1
VTS	0.0	400.9	598.8	355.9		481.9
SS	606.0	43.9	599.9	177.9	373.8	278.0
VSS	221.8	23.7	225.7	90.0	162.0	127.8
SETT SOL	4.0	0.2	5.0	0.1	0.4	0.3
COLOR	2125.0	1750.0	1800.0	1150.0	1650.0	1750.0
PH	7.5		7.1	7.5	7.3	7.4
NITROGEN	8.7		3.1			
PHOSPHOR	3.1		1.2			
DO-CONT.		0.0		6.6		
SS-CONT.		5756.2				
VSS-CONT		2403.7				
SET-BOD			131.0	42.0	89.0	
SLUDGE-SETT		160.0				

DAY 437 IN FILE RECORD 82 DATA FOR 3/13/69

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	80.0	
D.O.	6.9		5.4	6.3	0.6	
TEMP - C	32.0	24.0	27.0	12.0	20.0	
BOD5	175.0	91.0	103.0	46.0		85.0
TS	1778.1	1585.9	1475.9	1419.9		1495.0
VTS	608.9	498.0	436.7	440.9		483.9
SS	671.9	453.7	285.9	214.2	531.9	397.9
VSS	314.0	279.8	221.8	173.9	314.8	299.9
SETT SOL	3.0	1.0	1.1	0.4	0.2	0.8
COLOR	1850.0	1800.0	1425.0	1175.0	1800.0	1650.0
PH		7.1	6.9	7.4	6.9	6.9
NITROGEN				3.4		
PHOSPHOR				0.8		
DO-CONT.		0.6		6.5	0.8	
SS-CONT.		15934.1				357.9
VSS-CONT		6043.8				274.0
SET-BOD			94.0	35.0	85.0	
SLUDGE-SETT		350.0				5.0

DAY 438 IN FILE RECORD 83 DATA FOR 3/14/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	80.0	
D.O.	7.0		5.2	7.5	1.1	
TEMP - C	32.0	26.0	26.0	12.0	21.0	
BOD5	132.0	123.0	198.0	54.0		7.0
TS	4369.9	1504.0	1781.0	1365.0		1441.0
VTS	1821.8	419.9	626.0	365.9		412.1
SS	484.0	364.0	536.1	205.9	316.1	274.0
VSS	87.8	169.9	236.1	122.0	177.9	142.1
SETT SOL	16.0	0.2	8.5	0.5	1.2	0.1
COLOR	1300.0	1550.0	1400.0	950.0	950.0	1200.0
PH		7.8	7.3	7.6	7.3	7.1
NITROGEN						
PHOSPHOR						
DO-CONT.		0.2		7.6	1.3	
SS-CONT.						903.9
VSS-CONT						364.0
SET-BOD			134.0	43.0	7.0	
SLUDGE-SETT						30.0

DAY 441 IN FILE RECORD 84 DATA FOR 3/17/69

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	80.0	
D.O.			5.6	8.7	4.8	
TEMP - C		27.0	30.0	14.0	22.0	
BOD5	206.0	134.0	192.0	41.0		86.0
TS		1781.0	1968.0	1433.1		1537.0
VTS		554.9	669.9	450.9		434.9
SS		509.9	683.8	207.8	1401.9	335.9
VSS		221.8	293.8	115.9	572.1	187.9
SETT SOL		1.5	7.5	0.2	33.0	0.1
COLOR		1800.0	2100.0	950.0	5200.0	1500.0
PH		6.9	7.0	7.1	6.9	7.1
NITROGEN		1.4				
PHOSPHOR		1.8				
DO-CONT.		0.5		7.0	4.8	
SS-CONT.		18901.9				884.0
VSS-CONT		8498.3				383.8
SET-BOD			138.0	33.0	86.0	
SLUDGE-SETT		200.0				5.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 443 IN FILE RECORD 85 DATA FOR 3/19/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	80.0	
D.O.	5.0		4.5	5.9	0.5	
TEMP - C	34.0	29.0	29.0	15.0	24.0	
BOD5	197.0	110.0	166.0	48.0		85.0
TS	2657.9	1409.9	1494.9	1427.0		1528.0
VTS	447.8	346.9	370.8	405.9		424.9
SS	548.0	202.0	252.0	163.8	279.8	109.8
VSS	141.9	68.0	81.7	75.9	151.9	63.7
SETT SOL	36.0	0.4	2.5	0.2	0.6	1.0
COLOR	2250.0	1700.0	1700.0	1200.0	1600.0	1700.0
PH		7.8	7.7	7.7	7.6	7.5
NITROGEN		6.1				
PHOSPHOR		1.3				
DO-CONT.		0.5		5.9	0.5	
SS-CONT.		11842.0				2129.8
VSS-CONT		5375.1				807.6
SET-BOD			154.0	40.0	85.0	
SLUDGE-SETT		490.0				20.0

DAY 444 IN FILE RECORD 86 DATA FOR 3/20/69

	PF	TF1	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	80.0	
D.O.	4.2		3.2	5.7	0.5	
TEMP - C	33.0	29.0	30.0	17.0	24.0	
BOD5	249.0	120.0	174.0	39.0		32.0
TS	1470.9	1506.9	1569.9	1363.0		1533.9
VTS	700.9	534.9	557.9	505.9		542.8
SS	242.0	283.8	320.1	155.9	405.8	267.9
VSS	110.1	123.8	144.0	82.0	202.0	144.0
SETT SOL	0.0	0.2	5.0	0.0	3.0	1.5
COLOR	1700.0	1400.0	1400.0	1000.0	1450.0	1450.0
PH	7.5	7.4	7.3	7.6	7.5	7.5
NITROGEN	0.0			3.6		5.0
PHOSPHOR	4.3			1.1		1.6
DO-CONT.		0.5		5.5	0.6	
SS-CONT.		11448.0				462.8
VSS-CONT		5778.9				220.0
SET-BOD			132.0	9.0	32.0	
SLUDGE-SETT		500.0				20.0

DAY 445 IN FILE RECORD 87 DATA FOR 3/21/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	80.0	
D.O.	5.4		4.6	8.4	0.3	
TEMP - C	32.0	26.0	28.0	16.0	21.0	
BOD5	203.0	78.0	129.0	37.0		78.0
TS	1634.9	6490.0	1457.9	1426.0		1454.0
VTS	597.9	469.8	499.0	404.8		418.0
SS	338.1	245.9		229.7		272.2
VSS	169.9	108.0		137.9		150.1
SETT SOL	0.5	0.3	1.5	0.3		1.5
COLOR	1700.0	1450.0	1400.0	1200.0		1100.0
PH	8.6	7.5	7.9	7.8		
NITROGEN	11.2					
PHOSPHOR	3.5					
DO-CONT.		0.7		6.6	0.4	
SS-CONT.		13009.9				
VSS-CONT		6623.3				
SET-BOD			114.0	33.0	78.0	
SLUDGE-SETT		520.0				30.0

DAY 448 IN FILE RECORD 88 DATA FOR 3/24/69

	PF	TF1	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	60.0	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	80.0	
D.O.						
TEMP - C						
BOD5	179.0	137.0	159.0	65.0		89.0
TS	2330.0	1616.9	1351.0	1446.9		1466.9
VTS	853.9	492.8	346.9	416.8		409.7
SS	919.7	351.8	177.9	267.9	242.0	259.7
VSS	127.8	151.9	54.0	118.0	163.8	121.7
SETT SOL	34.0	0.6	6.5	1.0	3.0	0.5
COLOR	2400.0	1900.0	1100.0	850.0	1100.0	1000.0
PH		7.9	7.4	7.6	7.3	
NITROGEN			5.6	9.5		
PHOSPHOR			1.7	1.6		
DO-CONT.						
SS-CONT.		15042.1				
VSS-CONT		7563.1				
SET-BOD			130.0	42.0	89.0	
SLUDGE-SETT		650.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 450 IN FILE RECORD 89 DATA FOR 3/26/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	62.5	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	60.0	
D.O.	4.0		5.3	5.8	0.5	
TEMP - C	27.0	25.0	27.0	14.0	20.0	
BOD5	196.0	115.0	178.0	46.0		68.0
TS	1770.9	1782.9	1672.9	1345.0		1412.9
VTS	541.0	558.9	517.1	324.9		413.8
SS	442.1	579.8	372.0	242.0	375.9	302.1
VSS	176.0	238.0	173.9	124.1	191.9	155.9
SETT SOL	0.2	1.5	2.5	0.5	3.0	0.2
COLOR	1800.0	1900.0	1850.0	800.0	850.0	1100.0
PH	7.6	7.1	7.2	7.1	7.4	7.4
NITROGEN	14.8			6.1		
PHOSPHOR	2.8			1.1		
DO-CONT.		0.2		5.4	0.9	
SS-CONT.		15617.9				2439.8
VSS-CONT		7365.4				989.8
SET-BOD			166.0	36.0	68.0	
SLUDGE-SETT		500.0				30.0

DAY 451 IN FILE RECORD 90 DATA FOR 3/27/69

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		44.4	44.4	24.4	62.5	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	60.0	
D.O.	7.4		5.8	7.0	0.4	
TEMP - C	31.0	24.0	26.0	13.0	19.0	
BOD5	219.0	66.0	134.0	43.0		50.0
TS	1699.9	1270.9	1490.9	1296.0		1259.0
VTS	573.7	370.8	453.8	402.0		358.9
SS	428.1	209.9	335.9	162.0	238.0	163.8
VSS	209.9	148.0	176.0	100.0	158.0	117.7
SETT SOL	3.0	0.1	2.0	0.5	3.0	0.0
COLOR	1950.0	1200.0	1450.0	800.0	1250.0	1250.0
PH	7.8	7.1	7.2	0.0	7.2	7.2
NITROGEN	9.0			0.0		1.9
PHOSPHOR	2.3			0.0		1.1
DO-CONT.		0.0		7.0	0.6	
SS-CONT.		16600.0				4344.1
VSS-CONT		8529.0				1603.8
SET-BOD			111.0	85.0	50.0	
SLUDGE-SETT		550.0				30.0

DAY 452 IN FILE RECORD 91 DATA FOR 3/28/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		44.4	44.4	24.4	62.5	62.5
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	60.0	
D.O.	7.5		5.0	4.8	0.6	
TEMP - C	30.0	27.0	28.0	14.0	21.0	
BOD5	200.0	94.0	178.0	44.0		67.0
TS	1697.9	1414.0	1531.9	1282.9		1342.0
VTS	565.9	401.8	473.9	351.9		371.0
SS	484.0	285.9	423.8		225.8	242.0
VSS	232.2	164.1	227.9		177.9	189.8
SETT SOL	2.5	0.2	5.0	0.2	3.5	0.2
COLOR	1950.0	1250.0	1750.0	850.0	1250.0	1150.0
PH	7.1	7.2	7.2	7.6	7.4	7.4
NITROGEN	1.5		2.4			
PHOSPHOR	4.8		2.0			
DO-CONT.		0.0		4.5	0.8	
SS-CONT.		15180.0				408.0
VSS-CONT		7590.0				243.8
SET-BOD			130.0	37.0	67.0	
SLUDGE-SETT		900.0				30.0

DAY 455 IN FILE RECORD 92 DATA FOR 3/31/69

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		44.4	44.4	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.8		5.8	6.3	3.6	
TEMP - C	28.0	24.0	25.0	13.0	15.0	
BOD5	317.0	134.0	193.0	80.0		
TS	2059.9	1809.9	1685.0	1499.0		
VTS	631.7	545.8	478.8	397.8		
SS	1473.9	484.0	426.0	354.0		
VSS	1203.8	303.9	171.7	163.8		
SETT SOL	1.8	1.0	2.6	3.0		
COLOR	2050.0	1750.0	1750.0	1200.0		
PH	7.1	7.2	7.3	7.3		
NITROGEN	0.6	3.7				
PHOSPHOR	0.9	1.3				
DO-CONT.		0.5		6.5	4.0	
SS-CONT.		13713.9				
VSS-CONT		6462.0				
SET-BOD			165.0	47.0		
SLUDGE-SETT		240.0				10.0

SHEET 23

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 457 IN FILE RECORD 93 DATA FOR 4/ 2/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		44.4	44.4	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.						
TEMP - C						
BOD5	174.0	109.0	200.0	74.0		57.0
TS	1621.0	1426.0	1616.9	1423.9		1322.0
VTS	539.9	403.0	532.9	403.9		338.9
SS	450.1	312.1	533.7	230.1	335.9	175.7
VSS	235.8	165.9	274.0	158.0	227.9	144.0
SETT SOL	0.8	1.4	3.5	2.0	0.9	0.1
COLOR	950.0	1050.0	1250.0	680.0	900.0	
PH	8.1	7.3	7.1	7.4	7.4	7.5
NITROGEN	6.8		5.4			
PHOSPHOR	4.0		2.6			
DO-CONT.						
SS-CONT.		15451.9				213.9
VSS-CONT		7069.2				169.9
SET-BOD			129.0	58.0	57.0	
SLUDGE-SETT		390.0				0.0

DAY 458 IN FILE RECORD 94 DATA FOR 4/ 3/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		44.4	44.4	30.4	31.2	
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.0			5.8	5.9	4.0
TEMP - C	32.0	27.0	28.0	16.0	17.0	
BOD5	185.0	88.0	207.0	48.0		
TS	1284.0	1439.0	1592.1	1328.8		
VTS	483.0	425.9	575.0	460.8		
SS	213.9	388.1	538.0	173.9	231.9	
VSS	128.1	200.1	283.8	141.8	154.0	
SETT SOL	0.8	2.5	4.0	3.5	0.4	
COLOR	1100.0	1650.0	1800.0	1000.0	1500.0	
PH	8.1	7.2	7.1	7.3	7.3	
NITROGEN	10.6			3.5		
PHOSPHOR	0.7			2.0		
DO-CONT.		0.5		6.1	4.4	
SS-CONT.		13847.9				
VSS-CONT		6425.4				
SET-BOD			120.0	32.0		
SLUDGE-SETT		220.0				

DAY 459 IN FILE RECORD 95 DATA FOR 4/ 4/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE		DELETE		
FEED-GPM		44.4	44.4	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	5.2		5.0	5.9	4.8	
TEMP - C	32.0	27.0	30.0	17.0	18.0	
BOD5	160.0	47.0	136.0	29.0		26.0
TS	1663.0	1475.0	1706.0	1340.9		1251.9
VTS	586.8	510.9	689.9	441.8		374.9
SS	379.9	314.0	487.9	171.8		133.9
VSS	139.7	100.0	267.8	77.8		73.8
SETT SOL	0.7	2.0	3.5	4.5	0.2	
COLOR	1650.0	1350.0	1650.0	900.0	900.0	
PH	7.8	6.9	6.9	7.4	7.2	7.1
NITROGEN	12.5					3.8
PHOSPHOR	3.6					1.4
DO-CONT.		0.6		6.0	5.0	
SS-CONT.		14432.0				346.0
VSS-CONT		7182.8				144.0
SET-BOD			89.0	18.0	26.0	
SLUDGE-SETT		330.0				0.0

DAY 462 IN FILE RECORD 96 DATA FOR 4/ 7/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		44.4	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	14.8	0.0	40.0	
D.O.	4.3		4.9	6.8	2.9	
TEMP - C	33.0	26.0	28.0	19.0	20.0	
BOD5	180.0		106.0	84.0		38.0
TS	1579.8		1439.8	1654.9		1295.9
VTS	592.9		430.9	619.9		382.9
SS	363.7		198.0	574.0	223.9	180.0
VSS	137.9		82.0	261.8	92.1	104.0
SETT SOL	0.3		1.2	10.5	0.2	0.1
COLOR	1650.0		1300.0	1450.0	950.0	
PH	7.2			7.4	7.3	7.3
NITROGEN	10.4					
PHOSPHOR	3.3					
DO-CONT.		0.1		6.9	3.1	
SS-CONT.		18944.0				379.9
VSS-CONT		8848.7				176.0
SET-BOD			141.0	31.0	38.0	
SLUDGE-SETT		370.0				5.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 476 IN FILE RECORD 97 DATA FOR 4/21/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		29.6	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		14.8	14.8	0.0	40.0	
D.O.	6.0		4.8	4.8	1.7	
TEMP - C	33.0	27.0	30.0	19.0	20.0	
BOD5	205.0	145.0	178.0	71.0		40.0
TS	1495.0	1692.9	1640.0	1484.0		1219.0
VTS	470.9	552.9	473.7	421.9		326.9
SS	270.0	405.8	467.8	420.2	285.9	126.0
VSS	164.1	225.7	277.9	210.2	167.8	126.0
SETT SOL	0.2	10.0	15.0	11.0	3.5	0.1
COLOR	1550.0	1550.0	1700.0	1300.0	1200.0	1000.0
PH	7.6	7.4	7.4	7.2	7.5	7.3
NITROGEN	9.0	4.2	6.0			
PHOSPHOR	2.7	2.1	3.0			
DO-CONT.		0.6		4.9	1.8	
SS-CONT.		1225.8				858.1
VSS-CONT		521.7				379.9
SET-BOD			109.0	24.0	40.0	
SLUDGE-SETT		25.0				20.0

DAY 478 IN FILE RECORD 98 DATA FOR 4/23/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		29.6	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		14.8	14.8	0.0	40.0	
D.O.	5.0		5.0	4.0	2.1	
TEMP - C	32.0	25.0	28.0	20.0	21.0	
BOD5	204.0	189.0	157.0	72.0		62.0
TS	1430.0	1372.9	1388.0	1427.0		1264.9
VTS	764.9	692.8	700.0	602.9		472.8
SS	299.9	315.8		378.1	563.9	173.9
VSS	355.8			368.0	422.0	0.0
SETT SOL	0.4	4.0	9.0	9.0	10.0	0.1
COLOR	1450.0	1300.0	1400.0	1100.0	1600.0	950.0
PH	8.8	7.0	7.2	7.4	8.1	7.5
NITROGEN	9.2			6.4		
PHOSPHOR	3.3			2.8		
DO-CONT.		0.5		4.0	2.5	
SS-CONT.		629.8				2766.1
VSS-CONT		491.9				1331.8
SET-BOD			96.0	36.0	62.0	
SLUDGE-SETT		15.0				50.0

DAY 479 IN FILE RECORD 99 DATA FOR 4/24/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		29.6	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		14.8	14.8	0.0	40.0	
D.O.			0.0	5.7	3.3	
TEMP - C			29.0	19.0	19.0	
BOD5	238.0	137.0	135.0	73.0		68.0
TS	1427.0	1437.9	1324.0	1353.9		1189.8
VTS	590.9	492.9	539.9	480.9		436.8
SS	428.1	1655.8	194.0	284.1	530.0	167.8
VSS	177.9	801.9	169.9	212.0	138.1	159.9
SETT SOL	1.2	5.0	0.6	6.5	9.0	0.4
COLOR	2000.0	1800.0	1650.0	1100.0	1450.0	850.0
PH		7.1	7.2	7.4	7.4	7.6
NITROGEN						
PHOSPHOR						
DO-CONT.				6.0		
SS-CONT.		202.0				487.9
VSS-CONT		0.0				274.0
SET-BOD			168.0	36.0	68.0	
SLUDGE-SETT		20.0				10.0

DAY 480 IN FILE RECORD 100 DATA FOR 4/25/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		29.6	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		14.8	14.8	0.0	40.0	
D.O.	6.2		7.0	1.0	0.4	
TEMP - C	29.0	27.0		20.0	20.0	
BOD5	384.0	174.0	222.0	86.0		43.0
TS	1860.9	2696.9	1686.0	1553.9		1195.9
VTS	739.7	572.8	581.0	493.8		406.9
SS		390.0	314.0	466.0	541.9	173.9
VSS		144.0	140.0	208.1	249.9	101.9
SETT SOL	0.2	5.0	3.5	9.0	8.0	0.4
COLOR	2550.0	2150.0	2000.0	1600.0	1850.0	1000.0
PH	8.9	7.5	8.3	7.5	7.4	7.4
NITROGEN	4.7					
PHOSPHOR	2.3					
DO-CONT.		0.2		0.5	0.4	
SS-CONT.		1543.8				118.1
VSS-CONT		699.6				90.0
SET-BOD			207.0	43.0	43.0	
SLUDGE-SETT		35.0				5.0

SHEET 25

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 483 IN FILE RECORD 101 DATA FOR 4/28/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		29.6	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		14.8	14.8	0.0	40.0	
D.O.						
TEMP - C						
BOD5	301.0	196.0	214.0	102.0		69.0
TS	1510.0	1651.0	1511.9	1820.9		1296.0
VTS	563.9	595.8	577.8	642.0		420.0
SS	221.8	570.0	135.8	733.9	1470.0	149.8
VSS	157.7	344.2		393.9	685.9	144.0
SETT SOL	0.6	6.5	6.0	16.0	33.0	0.2
COLOR	1550.0	1800.0	1550.0	1900.0	4900.0	1100.0
PH	7.2	7.2	7.1	7.5	7.4	7.6
NITROGEN	4.5	5.5				
PHOSPHOR	2.8	3.0				
DO-CONT.						
SS-CONT.		3483.8				880.1
VSS-CONT		1739.5				425.9
SET-BOD			171.0	63.0	69.0	
SLUDGE-SETT		80.0				20.0

DAY 485 IN FILE RECORD 102 DATA FOR 4/30/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		29.6	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		14.8	14.8	0.0	40.0	
D.O.	6.0			3.4	1.1	
TEMP - C	32.0	27.0		21.0	22.0	
BOD5	205.0	89.0	105.0	79.0		23.0
TS	1584.0	1539.0	1342.0	1706.8		1195.0
VTS	514.9	429.9	375.8	481.8		259.9
SS	311.8	436.0	82.0	602.1	3587.9	109.8
VSS	95.8	140.0	59.8	226.0	1439.4	17.9
SETT SOL	1.0	2.5	0.4	18.0	85.0	0.0
COLOR	1350.0	1350.0	1000.0	1600.0	6000.0	800.0
PH	7.4	7.5	7.4	7.6	7.4	7.5
NITROGEN	13.7		6.5			
PHOSPHOR	3.4		1.7			
DO-CONT.		0.4		3.5	1.2	
SS-CONT.		3975.8				1557.9
VSS-CONT		1925.8				603.8
SET-BOD			109.0	30.0	23.0	
SLUDGE-SETT		180.0				40.0

DAY 486 IN FILE RECORD 103 DATA FOR 5/ 1/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		29.6	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		14.8	14.8	0.0	40.0	
D.O.	5.9		4.8	2.8	1.0	
TEMP - C	33.0	28.0	30.0	21.0	21.0	
BOD5	251.0	183.0	183.0	86.0		36.0
TS	1446.9	1285.0	1240.0	1452.0		1219.0
VTS	437.8	358.9	343.0	481.9		295.9
SS	233.7	205.9	186.1	46.0	4639.8	124.2
VSS	51.8	69.8	44.2	6.1	1869.4	
SETT SOL	2.5	2.0	0.0	10.0	200.0	0.0
COLOR	1200.0	1000.0	900.0	950.0	10000.0	850.0
PH	7.3	7.2	7.3	7.4	7.3	7.5
NITROGEN	8.1			3.7		
PHOSPHOR	2.9			2.1		
DO-CONT.		0.5		2.9	1.1	
SS-CONT.		6076.0				9150.0
VSS-CONT		2905.5				3273.8
SET-BOD			152.0	44.0	36.0	
SLUDGE-SETT		130.0				190.0

DAY 487 IN FILE RECORD 104 DATA FOR 5/ 2/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE			DELETE	DELETE
FEED-GPM		29.6	29.6	30.4	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		14.8	14.8	0.0	40.0	
D.O.	3.6		4.2	2.5	0.7	
TEMP - C	34.0	28.0	30.0	22.0	23.0	
BOD5	168.0	56.0	117.0	85.0		24.0
TS	1442.1	1257.0	1460.1	1569.0		1238.0
VTS	510.9	379.8	519.9	509.9		350.9
SS	220.0	123.9	281.9	383.9	7583.9	159.9
VSS	162.0	97.9	169.9	389.7	2927.2	123.8
SETT SOL	1.0	1.0	5.0	26.0	325.0	0.0
COLOR	1500.0	1200.0	1300.0	1500.0	11000.0	1200.0
PH	7.3	7.4	7.4	7.5	7.3	7.4
NITROGEN	8.0					6.3
PHOSPHOR	2.7					1.7
DO-CONT.		0.5		2.4	0.8	
SS-CONT.		5986.0				1140.1
VSS-CONT		2957.6				512.0
SET-BOD			90.0	46.0	24.0	
SLUDGE-SETT		230.0				30.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 490 IN FILE RECORD 105 DATA FOR 5/ 5/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	7.5		7.7	2.0	0.6	
TEMP - C	33.0	29.0	25.0	25.0	27.0	
BOD5	221.0	62.0	68.0	88.0		26.0
TS	1464.9	1130.0	1235.9	1647.9		1242.0
VTS	514.9	306.0	381.9	516.9		342.9
SS	39.9	149.8	260.0	683.8	6040.0	280.1
VSS	17.9	47.9	168.1	343.9	2201.5	223.9
SETT SOL	1.0	1.2	3.5	35.0	900.0	0.1
COLOR	1200.0	1100.0	1100.0	1000.0	36000.0	950.0
PH	7.1	7.2	7.5	7.4	7.2	7.5
NITROGEN	13.7	9.7				
PHOSPHOR	2.0	1.9				
DO-CONT.		1.0		1.4	0.6	
SS-CONT.		4606.0				4971.9
VSS-CONT		2098.0				1879.8
SET-BOD			33.0	32.0	26.0	
SLUDGE-SETT		120.0				310.0

DAY 492 IN FILE RECORD 106 DATA FOR 5/ 7/69

	PF	TF1	TF2 DELETE	AL DELETE	OD	CL2
FEED-GPM		22.2	22.2	40.6	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.6		7.5	2.2	0.7	
TEMP - C	34.0	30.0	26.0	25.0	27.0	
BOD5	310.0	89.0	54.0	47.0		24.0
TS	1347.0	1351.9	1176.1	1372.0		1284.9
VTS	503.9	436.9	342.0	420.9		352.8
SS	222.1	319.8	339.9	400.0	13908.0	260.0
VSS	104.0	155.9	275.8	198.0	5385.2	123.8
SETT SOL	0.2	5.5	2.0	18.0	975.0	0.5
COLOR	1500.0	1350.0	990.0	1350.0	28500.0	1400.0
PH	7.1	7.3	7.5	7.5	7.3	7.5
NITROGEN	13.3		3.9			
PHOSPHOR	4.9		1.4			
DO-CONT.		1.0		2.0	0.9	
SS-CONT.		2331.8				4397.8
VSS-CONT		1130.0				1775.8
SET-BOD			34.0	19.0	24.0	
SLUDGE-SETT		60.0				240.0

DAY 493 IN FILE RECORD 107 DATA FOR 5/ 8/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	5.8		6.6	2.7	0.6	
TEMP - C	28.0	27.0	27.0	26.0	27.0	
BOD5	173.0	56.0	74.0	86.0		30.0
TS	1483.0	1235.9	1342.0	1526.0		1276.0
VTS	438.9	300.8	341.9	430.7		315.0
SS	368.0	126.0	262.1	530.0	13631.8	217.8
VSS	110.1	39.9	114.1	216.0	4659.3	32.0
SETT SOL	0.2	0.4	4.0	38.0	975.0	1.5
COLOR	1450.0	900.0	980.0	1800.0	30000.0	1200.0
PH	7.2	7.4	7.7	7.6	7.4	7.6
NITROGEN	11.8			6.7		
PHOSPHOR	3.6			2.4		
DO-CONT.		0.4		2.7	1.2	
SS-CONT.		5108.0				9328.0
VSS-CONT		2115.7				3247.0
SET-BOD			37.0	32.0	30.0	
SLUDGE-SETT		140.0				900.0

DAY 494 IN FILE RECORD 108 DATA FOR 5/ 9/69

	PF	TF1	TF2 DELETE	AL DELETE	OD	CL2
FEED-GPM		22.2	22.2	40.6	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.3		6.3	1.9	0.7	
TEMP - C	32.0	28.0	22.0	25.0	25.0	
BOD5	206.0	111.0	93.0	86.0		26.0
TS	1418.9	1157.0	1253.9	1443.0		1252.0
VTS	450.7	367.9	401.8	489.0		350.5
SS	271.9	628.0	222.1	442.1	17476.2	299.9
VSS	202.0	168.1	150.1	245.9	6176.0	137.9
SETT SOL	1.0	1.5	3.5	37.0	975.0	0.5
COLOR	1350.0	1000.0	1050.0	1700.0	40000.0	1300.0
PH	7.0	7.3	7.5	7.5	7.4	7.4
NITROGEN	12.9					9.8
PHOSPHOR	3.0					1.8
DO-CONT.		0.6		2.0	1.1	
SS-CONT.		6525.8				5544.1
VSS-CONT		3091.9				1945.9
SET-BOD			43.0	36.0	26.0	
SLUDGE-SETT		200.0				280.0

SHEET 27

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 497 IN FILE RECORD 109 DATA FOR 5/12/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.2		6.5	3.0	2.0	
TEMP - C	34.0	24.0	19.0	20.0	21.0	
BOD5	168.0	48.0	62.0	160.0		27.0
TS	1390.0	1245.8	1133.8	1549.9		1252.8
VTS	387.9	258.8	293.7	489.9		313.9
SS	267.9	118.1	111.9	544.1	1835.9	202.0
VSS	133.9	70.1	101.9	298.1	790.0	139.7
SETT SOL	0.5	0.1	1.2	50.0	75.0	0.1
COLOR	1100.0	950.0	800.0	1700.0	5000.0	1250.0
PH	8.2	7.9	7.8	7.6	7.6	7.6
NITROGEN	15.7	10.1				
PHOSPHOR	4.2	1.4				
DO-CONT.		0.7		3.2	2.5	
SS-CONT.		6831.9				17619.9
VSS-CONT		3415.3				3735.4
SET-BOD			34.0	49.0	27.0	
SLUDGE-SETT		250.0				940.0

DAY 499 IN FILE RECORD 110 DATA FOR 5/14/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.6		7.5	2.0	1.1	
TEMP - C	32.0	21.0	24.0	22.0	23.0	
BOD5	227.0	66.0	138.0	135.0		63.0
TS	1720.8	1463.0	1443.0	1478.8		1406.0
VTS	623.8	442.8	412.9	422.9		360.0
SS	365.9	286.2	244.1		3258.0	324.0
VSS	198.0	160.2	142.2		1319.8	158.0
SETT SOL	1.0	2.7	3.0	30.0	160.0	3.5
COLOR	1800.0	1600.0	1050.0	850.0	9000.0	1300.0
PH	7.8	7.4	7.4	7.4	7.3	7.3
NITROGEN	17.6		5.9			
PHOSPHOR	4.5		1.3			
DO-CONT.		1.9		1.5	1.4	
SS-CONT.		3587.9				18799.8
VSS-CONT		1795.7				3625.5
SET-BOD			53.0	49.0	63.0	
SLUDGE-SETT		180.0				950.0

DAY 500 IN FILE RECORD 111 DATA FOR 5/15/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.6		7.4	2.8	1.3	
TEMP - C	30.0	25.0	23.0	22.0	23.0	
BOD5	183.0	40.0	298.0			61.0
TS	1506.0	1602.9	1427.9	1743.0		1395.1
VTS	517.9	355.8	412.8	530.0		399.0
SS	405.8	169.9	344.2	659.7	8191.8	239.8
VSS	166.0	96.1	183.9	303.8	2895.8	114.1
SETT SOL	0.8	1.0	4.0	50.5	610.0	0.0
COLOR	2100.0	1100.0	1300.0	1900.0	19500.0	1200.0
PH	7.8	7.4	7.5	7.4	7.3	7.4
NITROGEN	15.7			12.3		
PHOSPHOR	3.9			2.8		
DO-CONT.		1.5		2.7	1.5	
SS-CONT.		5151.9				9307.8
VSS-CONT		2281.2				3137.6
SET-BOD			66.0	71.0	61.0	
SLUDGE-SETT		160.0				890.0

DAY 501 IN FILE RECORD 112 DATA FOR 5/16/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6	31.2	31.2
DEPTH-FT		24.0	24.0	6.7	4.0	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.0		7.4	1.8	0.8	
TEMP - C	35.0	28.0	25.0	24.0	25.0	
BOD5	191.0	41.0	314.0	122.0		72.0
TS	1665.0	1277.0	1562.0	1916.9		1298.9
VTS	535.8	352.8	491.8	619.9		306.9
SS	415.9	110.1	404.0	700.0	4539.7	226.1
VSS	180.0	38.1	199.8	311.8	1743.7	80.2
SETT SOL	1.3	2.0	3.6	54.0	210.0	0.8
COLOR	2050.0	1050.0	1250.0	2300.0	9000.0	1100.0
PH	7.2	7.3	7.4	7.4	7.3	7.4
NITROGEN	13.3					9.5
PHOSPHOR	3.7					2.5
DO-CONT.		0.6		1.0	1.0	
SS-CONT.		4666.1				14824.2
VSS-CONT		2139.8				4934.9
SET-BOD			67.0	57.0	72.0	
SLUDGE-SETT		30.0				540.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 504 IN FILE RECORD 113 DATA FOR 5/19/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6		
DEPTH-FT		24.0	24.0	6.7		
RECY-GPM		22.2	22.2	0.0		
D.O.	7.4		7.6	1.8		
TEMP - C	32.0	28.0	26.0	25.0		
BOD5						
TS	1490.0	1213.0	1329.9	1672.0		
VTS	501.0	374.9	432.7	534.8		
SS	481.8	310.0	422.0	669.8		
VSS	217.8	159.8	209.9	342.0		
SETT SOL	0.3	1.5	5.0	32.0		
COLOR	1780.0	1000.0	1250.0	1700.0		
PH	7.6	7.7	7.7	7.5		
NITROGEN	9.0	7.6				
PHOSPHOR	2.4	1.6				
DO-CONT.		1.5		1.6		
SS-CONT.		16713.8				
VSS-CONT		7113.4				
SET-BOD						
SLUDGE-SETT		55.0				

DAY 506 IN FILE RECORD 114 DATA FOR 5/21/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6		
DEPTH-FT		24.0	24.0	6.7		
RECY-GPM		22.2	22.2	0.0		
D.O.	6.4		7.5	2.0		
TEMP - C	34.0	27.0	23.0	25.0		
BOD5	207.0	68.0	144.0	125.0		
TS	1524.9	1340.0	1389.9	1416.9		
VTS	487.9	339.0	386.9	406.9		
SS	534.0	281.9	343.9	428.1		
VSS	199.8	122.0	151.9	202.0		
SETT SOL	1.5	2.5	3.5	15.0		
COLOR	1800.0	1300.0	1200.0	1100.0		
PH	6.8	7.2	7.4	7.4		
NITROGEN	10.6		2.2			
PHOSPHOR	2.6		2.2			
DO-CONT.		1.5		1.8		
SS-CONT.		10159.9				
VSS-CONT		4585.1				
SET-BOD			51.0	74.0		
SLUDGE-SETT		340.0				

DAY 507 IN FILE RECORD 115 DATA FOR 5/22/69

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6		
DEPTH-FT		24.0	24.0	6.7		
RECY-GPM		22.2	22.2	0.0		
D.O.	7.0		7.5	1.7		
TEMP - C	33.0	28.0	25.0	25.0		
BOD5	189.0	54.0	152.0	135.0		
TS	1454.9	1350.8	1261.9	1269.0		
VTS	503.9	424.8	376.8	371.9		
SS	203.8	205.9	205.9	242.0		
VSS	131.8	137.9	123.8	149.8		
SETT SOL	0.3	1.5	7.5	7.0		
COLOR	1500.0	1250.0	1105.0	1150.0		
PH	7.0	7.3	7.4	7.4		
NITROGEN	8.1			0.8		
PHOSPHOR	2.3			2.0		
DO-CONT.		1.1		1.0		
SS-CONT.		18901.9				
VSS-CONT		8967.0				
SET-BOD			31.0	60.0		
SLUDGE-SETT		80.0				

DAY 508 IN FILE RECORD 116 DATA FOR 5/23/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		22.2	22.2	40.6		
DEPTH-FT		24.0	24.0	6.7		
RECY-GPM		22.2	22.2	0.0		
D.O.			7.4	0.7		
TEMP - C		22.0	28.0	23.0		
BOD5	188.0	64.0	181.0	83.0		
TS	1575.0	1358.0	1360.0	1245.8		
VTS	530.9	390.9	379.8	319.9		
SS	373.8	260.0	260.0			
VSS	161.7	122.0	147.9			
SETT SOL	0.5	1.0	2.5	2.5		
COLOR	1900.0	1100.0	1150.0	700.0		
PH	6.9	7.3	7.5	7.5		
NITROGEN	7.7					
PHOSPHOR	1.7					
DO-CONT.		1.0		0.5		
SS-CONT.		10888.0				
VSS-CONT		5095.6				
SET-BOD			52.0	31.0		
SLUDGE-SETT		310.0				

SHEET 29

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 513 IN FILE RECORD 117 DATA FOR 5/28/69

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		33.3	33.3	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.	0.7		5.1	6.5	0.5	
TEMP - C	35.0	31.0	32.0	24.0	29.0	
BOD5	194.0	62.0	140.0	141.0		41.0
TS	1472.9	1260.9	1517.9	2247.0		1184.9
VTS	546.8	394.9	546.9	821.9		381.9
SS	350.0	256.0	431.8	1100.1	1027.8	130.0
VSS	202.0	176.0	249.8	468.1	539.8	
SETT SOL	0.6	0.4	5.7	22.0	31.0	1.0
COLOR	1700.0	1160.0	1300.0	2150.0	1450.0	500.0
PH	7.4	7.3	7.4	7.6	7.4	7.5
NITROGEN	7.4	5.1	6.8			
PHOSPHOR	2.9	2.0	2.9			
DO-CONT.		0.5		5.2	0.7	
SS-CONT.		13348.0				7479.8
VSS-CONT		5867.8				3157.2
SET-BOD			102.0	47.0	41.0	
SLUDGE-SETT		380.0				105.0

DAY 514 IN FILE RECORD 118 DATA FOR 5/29/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE				
FEED-GPM		33.3	33.3	80.0	80.0	80.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.	1.0		5.5	6.5	0.8	
TEMP - C	36.0	32.0	35.0	25.0	31.0	
BOD5	164.0	94.0	146.0	169.0		51.0
TS	1342.0	1283.8	1349.0	1655.1		1204.9
VTS	538.8	393.8	380.9	510.9		330.0
SS	86.0	212.0	300.2	584.1	1354.0	168.1
VSS	52.1	119.9	136.0	266.0	659.9	92.1
SETT SOL	1.0	0.8	6.8	14.0	71.0	10.0
COLOR	1250.0	1100.0	850.0	1450.0	2350.0	650.0
PH	7.1	7.4	7.2	7.5	7.4	7.5
NITROGEN	8.5			1.7		
PHOSPHOR	2.0			2.6		
DO-CONT.		0.5		6.0	1.0	
SS-CONT.		7534.1				5834.0
VSS-CONT		3703.8				2777.5
SET-BOD			101.0	41.0	51.0	
SLUDGE-SETT		285.0				235.0

DAY 518 IN FILE RECORD 119 DATA FOR 6/ 2/69

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		33.3	33.3	80.0	80.0	80.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.	2.6		5.5	5.5	0.4	
TEMP - C	38.0	34.0	35.0	26.0	32.0	
BOD5	242.0	110.0	170.0	184.0		67.0
TS	1721.0	1433.1	1669.0	1580.9		1450.9
VTS	562.9	416.8	517.8	520.9		440.9
SS	492.2	309.7	486.1	538.0	1696.1	338.1
VSS	258.1	165.9	235.8	236.1	844.0	212.0
SETT SOL	1.8	0.4	4.0	12.0	110.0	3.5
COLOR	1780.0	1250.0	1400.0	1180.0	4200.0	1100.0
PH	7.0	7.2	7.2	7.4	7.3	7.4
NITROGEN	3.5	2.0				
PHOSPHOR	6.7	4.7				
DO-CONT.		0.5		5.4	0.4	
SS-CONT.		13428.0				2299.8
VSS-CONT		6289.6				1127.8
SET-BOD			142.0	49.0	67.0	
SLUDGE-SETT		355.0				145.0

DAY 520 IN FILE RECORD 120 DATA FOR 6/ 4/69

	PF	TF1	TF2	AL	OD	CL2
					DELETE	DELETE
FEED-GPM		33.3	33.3	80.0	81.0	80.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.	4.0		4.2	6.3	1.0	
TEMP - C	37.0	32.0	32.0	20.0	27.0	
BOD5	167.0	88.0	122.0	153.0		14.0
TS	1861.8	1255.0	1492.9	1623.0		1207.1
VTS	698.7	332.8	456.9	434.0		274.0
SS	682.0	191.9	382.0	480.0	932.0	72.0
VSS	130.0	68.0	115.9	203.8	382.0	24.1
SETT SOL	3.0	0.0	4.0	14.0	60.0	0.0
COLOR	2000.0	1900.0	1950.0	1700.0	1300.0	900.0
PH		7.0	7.2	7.7	7.6	7.6
NITROGEN						
PHOSPHOR						
DO-CONT.		0.6		6.4	1.1	
SS-CONT.		16940.0				503.8
VSS-CONT		6315.2				220.0
SET-BOD			60.0	72.0	14.0	
SLUDGE-SETT		400.0				25.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 521 IN FILE RECORD 121 DATA FOR 6/ 5/69

	PF	TF1 DELETE	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	80.0	81.0	80.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.						
TEMP - C						
BOD5	167.0	73.0	134.0	160.0		15.0
TS	1474.9	1307.9	1539.9	1239.9		1170.0
VTS	519.9	411.8	541.9	292.0		292.0
SS	383.9	327.7	454.1	195.9	1124.2	174.2
VSS	159.8	203.8	201.9	109.8	511.9	100.0
SETT SOL	0.5	0.5	4.0	0.3	60.0	2.0
COLOR	1550.0	1050.0	1250.0	500.0	2000.0	550.0
PH	6.9	7.4	7.4	7.7	7.6	7.6
NITROGEN	7.6		3.9			
PHOSPHOR	4.2		3.2			
DO-CONT.						
SS-CONT.		16683.9				1529.8
VSS-CONT		6845.4				700.0
SET-BOD			100.0	41.0	15.0	
SLUDGE-SETT		430.0				100.0

DAY 522 IN FILE RECORD 122 DATA FOR 6/ 6/69

	PF DELETE	TF1 DELETE	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	80.0	81.0	80.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.	3.7		4.0	6.6	3.0	
TEMP - C	38.0	34.0	34.0	23.0	30.0	
BOD5	94.0	41.0	74.0	38.0		55.0
TS	1376.9	1156.9	1408.0	1205.9		1069.9
VTS	460.0	323.0	443.9	295.9		241.9
SS	284.1	115.9	346.0	151.9	1518.2	97.9
VSS	100.0	47.9	156.2	65.9	659.9	56.1
SETT SOL	1.0	0.0	5.0	1.5	65.0	0.7
COLOR	1300.0	900.0	1400.0	500.0	2950.0	400.0
PH	7.0	7.4	7.4	7.6	7.5	7.6
NITROGEN	9.2					1.2
PHOSPHOR	3.0					0.6
DO-CONT.		0.4		6.7	3.0	
SS-CONT.		17539.9				921.9
VSS-CONT		7212.4				400.0
SET-BOD			69.0	19.0	55.0	
SLUDGE-SETT		450.0				50.0

DAY 525 IN FILE RECORD 123 DATA FOR 6/ 9/69

	PF	TF1 DELETE	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	80.0	81.0	80.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.	2.4		6.0	7.3	1.3	
TEMP - C	36.0	32.0	31.0	21.0	29.0	
BOD5	201.0	92.0	143.0	220.0		23.0
TS	1604.0	1578.9	1552.8	1608.8		1212.9
VTS	622.0	567.9	533.8	499.7		368.8
SS	256.0	321.9	321.9	473.9	1476.1	83.9
VSS	120.2	191.9	191.9	205.9	735.9	37.8
SETT SOL	0.5	3.5	5.5	13.0	202.0	0.2
COLOR	2000.0	2000.0	1600.0	1400.0	3600.0	800.0
PH	7.1	7.5	7.4	7.8	7.6	7.6
NITROGEN	10.3	3.9				
PHOSPHOR	2.9	3.0				
DO-CONT.		0.6		7.2	1.5	
SS-CONT.		19383.8				5059.8
VSS-CONT		8125.7				2449.4
SET-BOD			122.0	49.0	23.0	
SLUDGE-SETT		880.0				940.0

DAY 527 IN FILE RECORD 124 DATA FOR 6/11/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		33.3	33.3	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.				7.5	1.8	
TEMP - C		34.0		25.0	30.0	
BOD5	167.0	47.0	122.0	130.0		21.0
TS	1411.0	1514.0	1552.1	1318.0		1072.9
VTS	447.8	491.9	494.9	342.0		220.9
SS	491.9	538.0	589.9	223.9	1674.1	102.2
VSS	131.7	177.8	201.9	59.8	780.0	30.2
SETT SOL	0.5	7.0	7.0	3.5	80.0	0.3
COLOR	1650.0	1450.0	1350.0	700.0	3700.0	600.0
PH	7.1	7.3	7.4	8.0	7.6	7.6
NITROGEN	10.3		6.8			
PHOSPHOR	3.2		3.2			
DO-CONT.		0.4		7.1	2.2	
SS-CONT.		18598.0				9023.7
VSS-CONT		7314.6				4079.6
SET-BOD			75.0	32.0	21.0	
SLUDGE-SETT		940.0				950.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 528 IN FILE RECORD 125 DATA FOR 6/12/69

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3	0.0	40.0	
D.O.	5.0		5.6	6.6	1.3	
TEMP - C	35.0	34.0	35.0	26.0	30.0	
BOD5	219.0	114.0	127.0	177.0		19.0
TS	1567.9	1584.9	1371.9	1263.1		1062.0
VTS	535.7	499.8	416.9	311.1		247.8
SS	614.0	570.0	368.0	256.0	1423.9	99.7
VSS	213.9	216.0	129.9	64.0	675.9	27.7
SETT SOL	8.0	11.0	4.5	3.5	60.0	0.5
COLOR	1900.0	1600.0	1250.0	650.0	3500.0	400.0
PH	7.1	7.4	7.3	7.7	7.6	8.2
NITROGEN	3.4			1.7		
PHOSPHOR	2.4			1.4		
DO-CONT.		0.6		6.1	1.5	
SS-CONT.		17650.1				1921.9
VSS-CONT		7589.5				903.9
SET-BOD			81.0	102.0	19.0	
SLUDGE-SETT		920.0				150.0

DAY 529 IN FILE RECORD 126 DATA FOR 6/13/69

	PF DELETE	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		33.3	33.3	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		33.3	33.3		40.0	
D.O.	6.5		6.7	7.0	3.1	
TEMP - C	34.0	30.0	32.0	25.0	28.0	
BOD5	58.0	70.0	170.0	190.0		
TS						
VTS						
SS					2210.0	
VSS					1056.1	
SETT SOL	3.5	0.3	6.5	3.0	250.0	
COLOR	1300.0	2100.0	2020.0	750.0	4800.0	
PH		8.9	8.8	8.3	8.1	8.0
NITROGEN						
PHOSPHOR						
DO-CONT.		0.7		7.1	3.5	
SS-CONT.						
VSS-CONT						
SET-BOD			134.0	31.0		
SLUDGE-SETT		350.0				

DAY 532 IN FILE RECORD 127 DATA FOR 6/16/69

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.0		6.1	6.9	1.2	
TEMP - C	36.0	25.0	31.0	23.0	29.0	
BOD5	174.0	113.0	87.0	108.0		60.0
TS	1259.0	1323.0	1225.1	1389.0		1058.9
VTS	489.8	471.0	437.0	435.8		331.9
SS	296.0	207.8	230.1	444.0	1647.9	135.8
VSS	245.9	175.7	185.8	270.0	885.7	91.8
SETT SOL	0.6	0.5	5.0	9.5	180.0	0.2
COLOR	1450.0	1800.0	1300.0	1300.0	3850.0	700.0
PH		8.6	8.1	8.1	7.8	7.7
NITROGEN		10.9	12.3			
PHOSPHOR		3.2	2.6			
DO-CONT.		0.8		7.2	1.3	
SS-CONT.		14165.9				2962.0
VSS-CONT		6068.6				1547.6
SET-BOD			53.0	72.0	60.0	
SLUDGE-SETT		890.0				600.0

DAY 534 IN FILE RECORD 128 DATA FOR 6/18/69

	PF DELETE	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		22.2	22.2	80.0	71.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	5.6		5.3	7.2	1.0	
TEMP - C	37.0	28.0	32.0	24.0	29.0	
BOD5	201.0	52.0	140.0	126.0		25.0
TS	1221.9	1004.9	1259.9	1135.0		929.8
VTS	441.8	287.9	391.9	378.9		277.9
SS	249.9	130.0	375.9	176.0	1538.0	61.9
VSS	150.1	59.8	212.0	98.2	795.8	41.8
SETT SOL	0.5	0.5	10.0	2.5	200.0	0.0
COLOR	1250.0	900.0	900.0	700.0	3950.0	400.0
PH	8.5	8.2	7.8	7.8	7.7	8.0
NITROGEN	18.9		13.4			
PHOSPHOR	4.6		4.1			
DO-CONT.		1.0		7.0	1.5	
SS-CONT.		13976.1				9675.9
VSS-CONT		5598.8				4683.1
SET-BOD			78.0	62.0	25.0	
SLUDGE-SETT		890.0				910.0

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DAY 535 IN FILE RECORD 129 DATA FOR 6/19/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	22.2	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.4		7.0	7.4	1.1	
TEMP - C	36.0	34.0	34.0	24.0	30.0	
BOD5	241.0	111.0	90.0	159.0		37.0
TS	1459.9	1383.0	1689.9	1130.0		944.9
VTS	450.8	386.8	539.9	403.9		178.9
SS	468.1	410.1	754.0	221.8	877.9	49.7
VSS	104.0	120.2	280.1	27.7	408.0	19.8
SETT SOL	20.0	0.8	13.0	2.5	120.0	0.5
COLOR	1400.0	1700.0	2150.0	550.0	2300.0	350.0
PH	8.4	8.0	8.1	7.9	8.0	7.9
NITROGEN	17.7			1.2		2.4
PHOSPHOR	4.3			2.9		2.6
DO-CONT.		0.6		6.4	1.3	
SS-CONT.		15073.8				4216.0
VSS-CONT		5755.1				2063.7
SET-BOD			189.0	33.0	37.0	
SLUDGE-SETT		910.0				800.0

DAY 536 IN FILE RECORD 130 DATA FOR 6/20/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	22.2	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.1		7.1	7.3	0.5	
TEMP - C	36.0	31.0	34.0	25.0	29.0	
BOD5	251.0	55.0	201.0	33.0		21.0
TS	1930.0	1295.0	1629.0	1077.1		1154.0
VTS	728.9	415.8	575.0	304.9		369.0
SS	732.1	180.0	435.7	124.2	1535.9	48.2
VSS	389.9	127.8	287.7	74.1	791.7	
SETT SOL	5.0	0.5	3.0	1.0	180.0	0.5
COLOR	2000.0	800.0	1550.0	450.0	3600.0	300.0
PH	8.4	8.0	8.5	8.2	7.9	8.1
NITROGEN	18.9					
PHOSPHOR	5.2					
DO-CONT.		0.6		7.0	0.7	
SS-CONT.		17239.9				3020.0
VSS-CONT		7049.4				1589.7
SET-BOD			196.0	42.0	21.0	
SLUDGE-SETT		940.0				420.0

DAY 539 IN FILE RECORD 131 DATA FOR 6/23/69

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.				7.4	4.5	
TEMP - C		28.0		22.0	27.0	
BOD5	172.0	79.0	162.0	144.0		95.0
TS	1239.0	1044.0	1626.8	1251.9		1334.9
VTS	430.8	308.9	608.9	326.8		447.8
SS	361.9	163.8	777.8	263.9	1647.9	427.8
VSS	151.9	54.0	281.9	71.6	773.8	209.9
SETT SOL	0.7	0.5	8.0	1.5	160.0	15.0
COLOR	1800.0	1200.0	2500.0	700.0	3000.0	1100.0
PH		8.4	8.2	8.0	7.9	8.1
NITROGEN		11.3				
PHOSPHOR		2.4				
DO-CONT.		1.3		6.9	4.8	
SS-CONT.		17622.0				
VSS-CONT		6481.3				
SET-BOD			127.0	27.0	95.0	
SLUDGE-SETT		940.0				

DAY 541 IN FILE RECORD 132 DATA FOR 6/25/69

	PF	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	6.0		6.3	7.6	1.2	
TEMP - C	37.0	32.0	34.0	24.0	29.0	
BOD5	197.0		88.0	34.0		33.0
TS	1385.0	1489.8	1650.0	1069.0		1186.0
VTS	523.9	475.8	591.8	287.9		335.8
SS	432.1	230.1	288.0	164.1	9471.7	203.8
VSS	174.2	123.8	140.0	90.0	4317.2	101.9
SETT SOL	0.5	0.0	2.0	0.5	845.0	2.0
COLOR	2200.0	2100.0	1750.0	500.0	21000.0	3800.0
PH	8.8	8.6	8.6	8.6	7.9	8.0
NITROGEN	14.7		14.5			
PHOSPHOR	3.8		3.7			
DO-CONT.		0.4		7.5	1.7	
SS-CONT.		22362.0				10816.0
VSS-CONT		8493.1				5193.8
SET-BOD			322.0	23.0	33.0	
SLUDGE-SETT		890.0				660.0

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DAY 542 IN FILE RECORD 133 DATA FOR 6/26/69

	PF	TF1	TF2	AL	OD	CL2
					DELETE	DELETE
FEED-GPM		22.2	22.2	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	6.2		7.5	7.1	0.9	
TEMP - C	39.0	34.0	36.0	27.0	33.0	
BOD5	280.0	81.0	193.0	66.0		22.0
TS	1534.1	1396.9	1558.0	1096.0		1105.9
VTS	588.0	490.7	568.8	291.9		312.8
SS	354.0	155.9	321.9	45.7	6882.0	36.0
VSS	108.0	52.1	144.0		3377.6	23.8
SETT SOL	1.0	0.0	3.0	1.0	840.0	1.5
COLOR	2200.0	1500.0	1900.0	700.0	16400.0	850.0
PH	7.2	7.5	7.7	8.0	7.8	7.8
NITROGEN	11.8		9.8			
PHOSPHOR	3.4		2.1			
DO-CONT.		0.5		7.7	1.3	
SS-CONT.		17532.0				9759.8
VSS-CONT		6797.1				4771.5
SET-BOD			131.0	38.0	22.0	
SLUDGE-SETT		870.0				930.0

DAY 543 IN FILE RECORD 134 DATA FOR 6/27/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2	80.0	81.0	81.0
DEPTH-FT		24.0	24.0	7.7	5.2	
RECY-GPM		22.2	22.2	0.0	40.0	
D.O.	5.7		6.1	7.5	0.9	
TEMP - C	37.0	34.0	37.0	29.0	33.0	
BOD5	261.0	102.0	226.0	34.0		21.0
TS	1614.0	1398.9	1539.0	1099.0		1138.0
VTS	521.9	353.7	468.7	239.0		214.0
SS	244.1	167.8	258.1	235.9	7872.0	31.7
VSS	70.1	29.8	72.0	155.9	3723.4	
SETT SOL	0.5	0.5	2.0	0.5	830.0	1.5
COLOR	2050.0	1700.0	1900.0	600.0	15000.0	6500.0
PH		6.8	7.2	7.9	7.5	7.6
NITROGEN						
PHOSPHOR						
DO-CONT.		0.4		6.9	1.1	
SS-CONT.		18103.9				12836.0
VSS-CONT		7221.6				5735.1
SET-BOD			180.0	30.0	21.0	
SLUDGE-SETT		940.0				980.0

DAY 546 IN FILE RECORD 135 DATA FOR 6/30/69

	PF	TF1	TF2	AL	OD	CL2
					DELETE	DELETE
FEED-GPM		22.2	22.2			
DEPTH-FT		24.0	24.0			
RECY-GPM		22.2	22.2			
D.O.	4.8		5.4			
TEMP - C	40.0	33.0	36.0			
BOD5	306.0	107.0	181.0	40.0		24.0
TS		1130.0				
VTS		355.9				
SS		199.8				
VSS		104.0				
SETT SOL		0.7	4.0			
COLOR		1650.0	1950.0			
PH		7.9	7.9			
NITROGEN		22.4	21.4			
PHOSPHOR		6.8	4.9			
DO-CONT.		0.5				
SS-CONT.						
VSS-CONT						
SET-BOD			169.0	29.0	24.0	
SLUDGE-SETT		870.0				

DAY 548 IN FILE RECORD 136 DATA FOR 7/ 2/69

	PF	TF1	TF2	AL	OD	CL2
					DELETE	DELETE
FEED-GPM		22.2	22.2			
DEPTH-FT		24.0	24.0			
RECY-GPM		22.2	22.2			
D.O.	6.2		6.8			
TEMP - C	35.0	31.0	34.0			
BOD5	261.0	87.0	152.0	68.0		12.0
TS	1725.0	1361.9	5230.0			
VTS	550.9	407.9				
SS	248.1	10.0	119.9			
VSS	131.8	2.1				
SETT SOL	1.5	0.7	2.0			
COLOR	2000.0	1300.0	1400.0			
PH	6.9	7.3	7.4			
NITROGEN	23.9		13.7			
PHOSPHOR	9.1		3.1			
DO-CONT.		0.6				
SS-CONT.		26701.9				
VSS-CONT		9975.8				
SET-BOD			139.0	22.0	12.0	
SLUDGE-SETT		310.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 549 IN FILE RECORD 137 DATA FOR 7/ 3/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2			
DEPTH-FT		24.0	24.0			
RECY-GPM		22.2	22.2			
D.O.	6.0		6.4			
TEMP - C	37.0	30.0	33.0			
BOD5	204.0	65.0	102.0	19.0		12.0
TS	1540.0	1450.9	1479.0			
VTS	513.9	413.9	498.8			
SS	422.0	433.9	421.7			
VSS	184.0	176.0	202.0			
SETT SOL	1.3	3.5	5.0			
COLOR	1650.0	1150.0	1300.0			
PH	6.7	7.2	7.2		7.7	
NITROGEN	17.7				3.9	
PHOSPHOR	5.4				1.6	
DO-CONT.		0.5				
SS-CONT.		17142.0				
VSS-CONT		6949.3				
SET-BOD			98.0	14.0	12.0	
SLUDGE-SETT		905.0				

DAY 569 IN FILE RECORD 138 DATA FOR 7/23/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM						
DEPTH-FT						
RECY-GPM						
D.O.						
TEMP - C						
BOD5	229.0	111.0	123.0	13.0		27.0
TS	1139.9	1056.9	1154.0	774.9		739.8
VTS	391.0	349.8	402.9	176.9		186.8
SS	137.0	251.7	329.8		2219.8	
VSS	20.5	68.0	114.1		985.8	
SETT SOL						
COLOR						
PH						
NITROGEN						
PHOSPHOR						
DO-CONT.						
SS-CONT.		727.8				3197.9
VSS-CONT		265.7				1473.9
SET-BOD			56.0	7.0	27.0	
SLUDGE-SETT						

DAY 574 IN FILE RECORD 139 DATA FOR 7/28/69

	PF	TF1	TF2	AL	OD	CL2
					DELETE	DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	2.5		6.9	7.5	0.9	
TEMP - C	36.0	31.0	29.0	26.0	29.0	
BOD5	163.0	134.0	73.0	63.0		10.0
TS	1205.9	587.0	1311.9	1177.9		964.9
VTS	486.8		444.8	355.9		278.8
SS	205.9	777.8	351.8	326.2	1552.1	99.7
VSS	45.7	353.9	198.0	140.0	738.1	59.8
SETT SOL	0.0	2.5	3.0	9.5	120.0	0.0
COLOR	1620.0	17800.0	1450.0	980.0	3850.0	420.0
PH	8.8	8.0	7.9	8.0	7.8	7.9
NITROGEN	25.2	16.5				
PHOSPHOR	3.3	3.2				
DO-CONT.		0.7		6.3	1.0	
SS-CONT.		1596.0				55065.9
VSS-CONT		687.7				30456.9
SET-BOD			40.0	38.0	10.0	
SLUDGE-SETT		200.0				990.0

DAY 576 IN FILE RECORD 140 DATA FOR 7/30/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	1.6		6.8	6.5	0.6	
TEMP - C	36.0	32.0	29.0	24.0	29.0	
BOD5	151.0	80.0	91.0	26.0		26.0
TS	1221.9	1118.9	1148.9	879.9		952.9
VTS	447.9	384.9	407.0	243.0		283.8
SS	332.0	346.0	229.7	43.9	1306.1	131.8
VSS	146.1	162.0	101.9	29.9	612.0	55.8
SETT SOL	0.7	1.9	5.5	0.0	140.0	0.6
COLOR	1750.0	1300.0	1100.0	380.0	3980.0	980.0
PH	8.9	8.3	7.9	8.0	7.6	7.8
NITROGEN	31.4		12.0			
PHOSPHOR	4.3		5.6			
DO-CONT.		0.6		6.5	0.6	
SS-CONT.		639.9				8054.2
VSS-CONT		266.0				3705.7
SET-BOD			45.0	22.0	26.0	
SLUDGE-SETT		20.0				975.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 577 IN FILE RECORD 141 DATA FOR 7/31/69

	PF	TF1	TF2 DELETE	AL	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	1.2		6.1	6.6	1.0	
TEMP - C	39.0	33.0	30.0	24.0	30.0	
BOD5	198.0	138.0	136.0	40.0		128.0
TS	1147.0	1287.0		1027.9		1374.0
VTS	499.9	544.9		256.8		519.9
SS	133.9	5343.9		101.0	8103.9	484.0
VSS	21.9			13.1	3635.4	218.1
SETT SOL	0.3	2.5	2.5	0.1	670.0	0.0
COLOR	1680.0	1820.0	1620.0	240.0	19100.0	1480.0
PH	8.8	8.2	7.9	6.4	7.2	7.6
NITROGEN	40.2			14.0		
PHOSPHOR	3.3					
DO-CONT.		0.7		6.5	1.0	
SS-CONT.		411.9				6997.9
VSS-CONT		221.8				2857.2
SET-BOD			58.0	24.0	128.0	
SLUDGE-SETT		20.0				20.0

DAY 578 IN FILE RECORD 142 DATA FOR 8/ 1/69

	PF	TF1	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	1.8		6.4	6.9	3.0	
TEMP - C	38.0	34.0	30.0	25.0	30.0	
BOD5	200.0	71.0	65.0	96.0		13.0
TS	1224.9	1051.0	1068.1	1687.9		916.0
VTS	525.0	400.9	441.1	566.9		323.0
SS	223.9	155.9	220.0	733.9	2058.1	90.0
VSS	191.9	144.0	162.0	347.8	1064.0	
SETT SOL	0.0	0.3	1.3	16.5	155.0	0.0
COLOR	1880.0	1380.0	1180.0	1880.0	5000.0	980.0
PH	7.8	7.1	7.6	7.9	7.6	7.8
NITROGEN	5.6					0.0
PHOSPHOR	1.8					1.4
DO-CONT.		0.7		7.4	3.1	
SS-CONT.		300.2				9930.1
VSS-CONT		254.1				4267.9
SET-BOD			62.0	12.0	13.0	
SLUDGE-SETT		15.0				940.0

DAY 581 IN FILE RECORD 143 DATA FOR 8/ 4/69

	PF DELETE	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.						
TEMP - C						
BOD5	160.0	77.0	136.0			
TS	1230.9		1130.9			
VTS	335.9		308.9			
SS	447.9	347.9	136.1			
VSS	111.9	113.7				
SETT SOL	18.0	1.0	4.0			
COLOR	800.0	1100.0	700.0			
PH						
NITROGEN	22.7	20.8				
PHOSPHOR		14.5				
DO-CONT.						
SS-CONT.		586.2				
VSS-CONT		222.1				
SET-BOD			68.0			
SLUDGE-SETT						

DAY 583 IN FILE RECORD 144 DATA FOR 8/ 6/69

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	3.8		7.5	6.4	3.2	
TEMP - C	35.0	31.0	29.0	25.0	29.0	
BOD5	201.0	105.0	70.0	7.0		8.0
TS	1215.0	1278.0		930.9		971.9
VTS	393.9	429.9		282.8		248.0
SS	325.9	444.0		180.0	1709.9	193.7
VSS	195.9	275.8		111.9	835.7	126.0
SETT SOL	0.5	1.0	2.0	0.5	120.0	2.0
COLOR	1800.0	1900.0	1800.0	400.0	4100.0	500.0
PH	7.3	7.3	7.4	8.0	7.6	7.8
NITROGEN	8.1		0.3			
PHOSPHOR	3.6		4.4			
DO-CONT.		1.5		7.1	3.2	
SS-CONT.		397.9				9209.9
VSS-CONT		216.0				4247.6
SET-BOD			59.0	4.0	8.0	
SLUDGE-SETT		5.0				930.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 584 IN FILE RECORD 145 DATA FOR 8/ 7/69

	PF	TF1	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	0.7		5.6	7.4	4.1	
TEMP - C	36.0	31.0	28.0	25.0	28.0	
BOD5	201.0	109.0	57.0	13.0		10.0
TS	1280.0	1160.0	1088.8	988.0		1049.0
VTS	442.0		313.8	231.8		381.9
SS	429.9	404.0	319.8	296.0	1737.9	149.8
VSS	84.1	155.9		70.1	790.0	
SETT SOL	0.5	0.5	1.5	0.5	125.0	0.5
COLOR	1350.0	1200.0	950.0	450.0	3550.0	450.0
PH	7.6	7.3	7.7	8.2	7.7	7.8
NITROGEN	0.3			0.8		
PHOSPHOR	2.4			2.4		
DO-CONT.		1.3		7.5	4.2	
SS-CONT.		604.2				4067.9
VSS-CONT		132.0				1901.7
SET-BOD			47.0	18.0	10.0	
SLUDGE-SETT		10.0				350.0

DAY 585 IN FILE RECORD 146 DATA FOR 8/ 8/69

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	2.2		6.4	7.0	4.2	
TEMP - C	35.0	33.0	30.0	26.0	29.0	
BOD5	274.0	121.0	71.0	15.0		11.0
TS	1567.0	1253.0	1224.9	1072.0		1083.9
VTS	755.9	481.9	471.8	415.8		485.9
SS	504.1	362.2	306.0	83.9	953.9	131.8
VSS	312.1	250.2	205.9		535.8	111.9
SETT SOL	0.5	0.5	1.5	0.5	70.0	0.5
COLOR	2100.0	1500.0	1500.0	500.0	2300.0	500.0
PH	8.9	7.5	7.8	8.1	7.8	7.9
NITROGEN	0.2					0.8
PHOSPHOR	2.7					3.8
DO-CONT.		1.8		7.4	4.3	
SS-CONT.		287.7				7203.9
VSS-CONT		202.0				3635.8
SET-BOD			80.0	9.0	11.8	
SLUDGE-SETT		0.0				920.0

DAY 588 IN FILE RECORD 147 DATA FOR 8/11/69

	PF	TF1	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.				8.1	4.2	
TEMP - C		29.0		22.0	26.0	
BOD5	163.0	99.0	82.0	22.0		33.0
TS	1389.0	1271.9	1086.8	922.0		914.0
VTS	577.9	439.8	406.9	231.9		246.7
SS	405.8	411.9	299.9	260.0	1468.2	126.0
VSS	168.1	216.0	155.9	121.7	724.1	73.8
SETT SOL	4.0	1.0	0.6	1.1	95.0	0.2
COLOR	1280.0	1150.0	1150.0	600.0	3300.0	680.0
PH	6.9	7.5	7.5	7.6	8.0	7.9
NITROGEN	3.2	3.3				
PHOSPHOR		5.0				
DO-CONT.		3.2		8.5	4.4	
SS-CONT.		351.8				3781.7
VSS-CONT		183.9				1843.5
SET-BOD			84.0	6.0	33.0	
SLUDGE-SETT		5.0				300.0

DAY 595 IN FILE RECORD 148 DATA FOR 8/18/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD DELETE	CL2 DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.			5.5	6.4	1.8	
TEMP - C		35.0	34.0	29.0	32.0	
BOD5	229.0	205.0	49.0	33.0		10.0
TS	1199.0	1159.9	996.0	1009.0		906.0
VTS	411.0	462.9	297.9	270.9		228.0
SS	256.0	249.9	179.7	155.9	1676.0	115.9
VSS	129.9	150.1	127.8	101.9	873.8	71.7
SETT SOL	3.0	0.5	1.5	3.0	1.0	0.0
COLOR	1280.0	1250.0	900.0	700.0	3600.0	530.0
PH	7.4	7.5	7.7	7.9	7.5	6.8
NITROGEN	1.6	0.6				
PHOSPHOR	3.0	3.3				
DO-CONT.		0.5		6.5	1.8	
SS-CONT.		326.2				404.0
VSS-CONT		165.9				248.0
SET-BOD			51.0	15.0	10.0	
SLUDGE-SETT		5.0				30.0

SHEET 37

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(HEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 597 IN FILE RECORD 149 DATA FOR 8/20/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	3.7		6.5	6.8	2.3	
TEMP - C	36.0	32.0	29.0	27.0	30.0	
BOD5	212.0	83.0	47.0	12.0		7.0
TS	1431.8	1212.9	1082.9	875.0		825.0
VTS	555.8	382.9	324.9	216.0		162.0
SS	635.9	4931.9	346.0	93.9	2308.0	36.0
VSS	294.1	1451.9	126.0	56.1	1064.0	24.1
SETT SOL	10.0	2.5	3.5	0.5	140.0	0.5
COLOR	1700.0	900.0	600.0	350.0	4600.0	250.0
PH	7.7	7.7	7.8	8.3	8.2	8.2
NITROGEN	4.2		0.6			
PHOSPHOR	2.6		2.1			
DO-CONT.		0.2		6.8	2.3	
SS-CONT.		346.0				9025.8
VSS-CONT		140.0				3461.4
SET-BOD			26.0	10.0	7.0	
SLUDGE-SETT		90.0				850.0

DAY 598 IN FILE RECORD 150 DATA FOR 8/21/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	0.2		5.6	7.7	3.7	
TEMP - C	37.0	32.0	27.0	23.0	28.0	
BOD5	183.0	78.0	49.0	22.0		8.0
TS	1234.9	1096.0	1199.9	979.0		910.9
VTS	527.9	351.0	384.9	259.9		218.8
SS	359.8	99.7	252.0	160.2	5515.7	82.0
VSS	225.8		180.0	106.1	2159.4	
SETT SOL	3.0	1.0	3.0	2.5	430.0	0.2
COLOR	1200.0	1000.0	1100.0	500.0	11500.0	380.0
PH	7.6	7.6	7.6	7.8	7.7	8.1
NITROGEN	2.1			0.3		
PHOSPHOR	2.1			2.0		
DO-CONT.		0.6		7.9	3.8	
SS-CONT.		469.9				1159.9
VSS-CONT		279.8				479.9
SET-BOD			26.0	9.0	8.0	
SLUDGE-SETT		12.0				10.0

DAY 599 IN FILE RECORD 151 DATA FOR 8/22/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	1.2		5.7	8.2	2.7	
TEMP - C	37.0	32.0	28.0	22.0	27.0	
BOD5	204.0	105.0	44.0	18.0		11.0
TS	1170.0	1080.9	1025.0	894.0		829.0
VTS	446.8	394.9	312.0	217.9		181.9
SS	436.0	275.8	270.0	108.0	4565.7	89.7
VSS	216.0	137.9	146.1	59.8	1805.7	59.8
SETT SOL						
COLOR	1350.0	1050.0	900.0	280.0	9000.0	280.0
PH	8.1	7.6	7.7	8.1	7.7	7.9
NITROGEN	1.6					0.1
PHOSPHOR	3.4					1.9
DO-CONT.		0.8		8.4	2.7	
SS-CONT.		96.1				10548.0
VSS-CONT		60.1				4043.0
SET-BOD			34.0	15.0	11.0	
SLUDGE-SETT		5.0				930.0

DAY 602 IN FILE RECORD 152 DATA FOR 8/25/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2	40.0	40.5	40.5
DEPTH-FT		24.0	24.0	5.5	5.2	
RECY-GPM		22.2	22.2		40.0	
D.O.	4.7		6.6	7.7	2.2	
TEMP - C	37.0	33.0	29.0	23.0	29.0	
BOD5	197.0	88.0	51.0	18.0		6.0
TS	1266.9	1237.0	1260.9	886.9		797.1
VTS	624.9	502.8	485.9	294.9		250.0
SS	504.1	43.9	552.0	179.7	9903.8	96.1
VSS	280.1		259.9	139.7	3983.3	
SETT SOL	3.0	2.0	6.0	1.5	590.0	0.2
COLOR	1550.0	1050.0	1050.0	300.0	10800.0	250.0
PH	8.2	7.8	7.7	8.1	7.6	7.9
NITROGEN	0.4	1.4				
PHOSPHOR	2.5	2.4				
DO-CONT.		0.3		7.4	2.2	
SS-CONT.		7340.0				4000.2
VSS-CONT		2415.6				1880.1
SET-BOD			31.0	10.0	6.0	
SLUDGE-SETT		100.0				295.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 605 IN FILE RECORD 153 DATA FOR 8/28/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2			
DEPTH-FT		24.0	24.0			
RECY-GPM		22.2	22.2			
D.O.	1.0		8.3			
TEMP - C	37.0	33.0	28.0			
BOD5	177.0	100.0	72.0			
TS	1270.1	1274.8	1385.9			
VTS	392.9	427.9	443.7			
SS	459.8	492.2	638.1			
VSS	306.0	236.1	335.9			
SETT SOL			9.0			
COLOR	1400.0	1450.0	1050.0			
PH	7.6	7.3	7.5			
NITROGEN	0.0	0.1				
PHOSPHOR	1.5	2.3				
DO-CONT.		0.8				
SS-CONT.						
VSS-CONT						
SET-BOD			34.0			
SLUDGE-SETT						

DAY 606 IN FILE RECORD 154 DATA FOR 8/29/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE	DELETE	DELETE
FEED-GPM		22.2	22.2			
DEPTH-FT		24.0	24.0			
RECY-GPM		22.2	22.2			
D.O.	5.2		6.1			
TEMP - C	35.0	32.0	28.0			
BOD5	230.0	140.0	50.0			
TS	1234.8	1213.9	1199.9			
VTS	392.8	357.8	312.9			
SS	256.0	212.0	214.2			
VSS	86.0	50.0	92.1			
SETT SOL	1.5	3.0	3.0			
COLOR	1800.0	1450.0	1250.0			
PH	8.3	7.8	7.7			
NITROGEN	11.3		2.4			
PHOSPHOR	2.3		2.8			
DO-CONT.		0.2				
SS-CONT.		1375.7				
VSS-CONT		603.8				
SET-BOD			32.0			
SLUDGE-SETT		30.0				

DAY 623 IN FILE RECORD 155 DATA FOR 9/15/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE				
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	5.0		6.3	2.0	1.0	
TEMP - C	34.0	30.0	28.0	24.0	30.0	
BOD5	264.0	43.0	52.0	214.0	20.0	18.0
TS	1473.9	1192.0	1076.0	1968.0		1015.0
VTS	526.8	413.9	252.9	672.8		218.0
SS	314.0	186.1	100.0	997.9	2185.9	106.2
VSS	72.0	39.9		231.9	1056.0	
SETT SOL	0.5	0.5	0.4	80.0	175.0	0.0
COLOR	1880.0	1200.0	580.0	3000.0	5500.0	480.0
PH	7.5	7.7	7.9	7.8	8.0	8.0
NITROGEN	8.9	0.4				
PHOSPHOR	0.7	0.7				
DO-CONT.		0.7		1.3	1.1	
SS-CONT.		11521.9				2936.0
VSS-CONT		5904.9				1482.1
SET-BOD			42.0	31.0	18.0	
SLUDGE-SETT		900.0				310.0

DAY 625 IN FILE RECORD 156 DATA FOR 9/17/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE			DELETE	DELETE
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	1.9		6.9	3.2	1.0	
TEMP - C	36.0	31.0	29.0	25.0	29.0	
BOD5	264.0	52.0	24.0	36.0	15.0	11.0
TS	1445.0	1159.9	971.9	1581.1		975.9
VTS	682.9	383.9	267.0	624.8		300.8
SS	411.9	230.1	73.8	556.0	2407.8	97.9
VSS	192.2	162.0		396.1	1383.7	
SETT SOL	0.7	0.1	0.2	120.0	210.0	0.0
COLOR	1650.0	1300.0	420.0	1750.0	4500.0	400.0
PH	7.4	7.5	7.7	7.6	7.5	7.6
NITROGEN	4.6		1.2			
PHOSPHOR			0.5			
DO-CONT.		0.6		2.8	1.0	
SS-CONT.		13724.0				7590.0
VSS-CONT		6641.0				3921.7
SET-BOD			14.0	26.0	11.0	
SLUDGE-SETT		950.0				950.0

SHEET 39

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 626 IN FILE RECORD 157 DATA FOR 9/18/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		14.8	66.7	32.0	DELETE	DELETE
DEPTH-FT		24.0	24.0	7.7	66.7	66.7
RECY-GPM		74.0	0.0		8.5	
D.O.	5.6		7.3	3.0	30.0	
TEMP - C	37.0	27.0	27.0	23.0	1.2	
BOD5	213.0	47.0	41.0	65.0	28.0	
TS	1184.9	1078.0	945.1	1167.9	13.0	19.0
VTS	427.0	313.9	219.0	347.8		994.0
SS	344.2	252.0	132.1	294.1	2230.2	286.9
VSS	144.0	122.0	61.9	166.0	1103.9	130.0
SETT SOL	1.0	1.5	2.0	30.0	200.0	63.7
COLOR	1780.0	1280.0	530.0	980.0	5000.0	1.5
PH	8.4	7.7	7.8	7.8	7.6	530.0
NITROGEN	21.6					7.7
PHOSPHOR	0.8					
DO-CONT.		0.7		3.0	1.2	
SS-CONT.		12372.1				
VSS-CONT		5271.7				1607.9
SET-BOD						808.0
SLUDGE-SETT		960.0	21.0	20.0	19.0	
						130.0

DAY 627 IN FILE RECORD 158 DATA FOR 9/19/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		DELETE			DELETE	DELETE
DEPTH-FT		14.8	66.7	32.0	66.7	66.7
RECY-GPM		24.0	24.0	7.7	8.5	
D.O.	6.0	74.0	0.0		30.0	
TEMP - C	33.0	25.0	7.2	4.3	1.0	
BOD5	209.0	43.0	25.0	22.0	27.0	
TS	1369.0	1085.0	42.0	114.0	21.0	20.0
VTS	558.8	368.9	964.9	1488.9		955.9
SS	532.2	248.1	345.8	591.8		463.8
VSS	295.9	150.1	199.8	771.7	829.7	260.0
SETT SOL	1.0	0.2	151.9	517.8	541.9	
COLOR	1870.0	1000.0	1.5	60.0		0.5
PH	8.1	7.4	480.0	1820.0	2100.0	470.0
NITROGEN	23.0		7.4	7.4	7.9	7.7
PHOSPHOR	0.8			0.7		5.5
DO-CONT.		0.5		0.7		0.1
SS-CONT.		12178.0		4.2	1.1	
VSS-CONT		5823.5				2743.8
SET-BOD			25.0	16.0	20.0	1443.5
SLUDGE-SETT		950.0				250.0

DAY 630 IN FILE RECORD 159 DATA FOR 9/22/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		14.8	66.7	32.0	DELETE	DELETE
DEPTH-FT		24.0	24.0	7.7	66.7	66.7
RECY-GPM		74.0	0.0		8.5	
D.O.	6.3		6.8	4.5	30.0	
TEMP - C	38.0	31.0	27.0	23.0	1.2	
BOD5	194.0	36.0	35.0	77.0	29.0	
TS	1228.0	926.0	908.9	2667.0	20.0	18.0
VTS	454.9	266.9	231.8	1124.9		850.9
SS	204.1	198.0	115.9	1823.7	1307.9	207.8
VSS	122.0	51.8		913.8	917.9	70.1
SETT SOL	0.2	0.1	2.0	72.0	100.0	0.1
COLOR	1370.0	680.0	420.0	4250.0	3500.0	340.0
PH	7.3	7.3	8.0	7.5	7.3	7.5
NITROGEN	0.4	1.3				
PHOSPHOR	0.9	1.0				
DO-CONT.		0.7		4.5	1.0	
SS-CONT.		13280.0				
VSS-CONT		6199.1				9069.8
SET-BOD			63.0	45.0	18.0	4561.2
SLUDGE-SETT		950.0				970.0

DAY 632 IN FILE RECORD 160 DATA FOR 9/24/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		14.8	DELETE	32.0	66.7	66.7
DEPTH-FT		24.0	66.7	7.7	8.5	
RECY-GPM		74.0	24.0		30.0	
D.O.			0.0			
TEMP - C						
BOD5	169.0	20.0	25.0	302.0	24.0	18.0
TS	1027.9	850.0	822.9	3111.9		830.0
VTS	344.9	290.0	385.8	1299.8		263.0
SS	244.1	151.9	130.0	2435.9	2442.0	109.8
VSS	114.1	127.8		1151.6	1225.6	
SETT SOL	3.0	0.2	1.5	90.0	200.0	0.5
COLOR	1160.0	550.0	320.0	4770.0	6500.0	300.0
PH	8.7	7.4	8.1	7.6	7.3	7.4
NITROGEN	27.2		0.5			
PHOSPHOR	1.2		0.7			
DO-CONT.						
SS-CONT.		14572.1				
VSS-CONT		6720.6				10591.7
SET-BOD			12.0	27.0	18.0	5305.3
SLUDGE-SETT		920.0				930.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 633 IN FILE RECORD 161 DATA FOR 9/25/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	6.0		7.5	3.3	1.0	
TEMP - C	37.0	30.0	26.0	23.0	28.0	
BOD5	244.0	52.0	31.0	261.0	33.0	25.0
TS	1418.9	1146.0	968.0	1996.9		953.9
VTS	459.8	264.9	216.0	727.8		230.8
SS	289.9	83.9	86.0	1202.0	2619.9	92.1
VSS	151.9	67.7		567.8	1309.7	56.1
SETT SOL	1.0	0.1	0.5	60.0	250.0	0.2
COLOR	1600.0	590.0	450.0	4300.0	5100.0	320.0
PH	8.3	7.9	8.0	7.6	7.4	7.5
NITROGEN	14.9			2.6		
PHOSPHOR	2.5			2.3		
DO-CONT.		0.6		3.0	1.0	
SS-CONT.		20907.9				14545.9
VSS-CONT		9515.1				7197.3
SET-BOD			31.0	37.0	25.0	
SLUDGE-SETT		900.0				950.0

DAY 634 IN FILE RECORD 162 DATA FOR 9/26/69

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	5.7		6.3	3.6	1.3	
TEMP - C	38.0	28.0	26.0	22.0	27.0	
BOD5	197.0	28.0	108.0	62.0	19.0	16.0
TS	1467.8	984.9	930.0	1034.8		949.0
VTS	547.8	317.9	295.0	303.9		250.0
SS	324.0	133.9	47.9	169.9	2815.8	141.9
VSS					1619.6	97.9
SETT SOL	2.0	0.2	0.1	8.0	240.0	0.2
COLOR	1490.0	650.0	300.0	450.0	620.0	320.0
PH	8.3	7.6	8.1	7.2	7.1	7.6
NITROGEN	20.3					0.8
PHOSPHOR	2.9					0.8
DO-CONT.		0.4		4.4	1.1	
SS-CONT.		17218.0				12966.0
VSS-CONT		8089.0				6503.7
SET-BOD			10.0	27.0	16.0	
SLUDGE-SETT		970.0				990.0

DAY 637 IN FILE RECORD 163 DATA FOR 9/29/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD DELETE	CL2 DELETE
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	7.5		6.5	4.5	0.7	
TEMP - C	35.0	27.0	25.0	21.0	27.0	
BOD5	229.0	109.0	154.0	119.0	116.0	113.0
TS	1432.0	1351.0	1497.9	1568.9		1523.8
VTS	572.9	445.9	553.9	583.9		512.9
SS	238.0	275.8	509.9	624.0	1149.9	507.8
VSS	70.1	119.9	245.9	303.9	585.8	231.9
SETT SOL	0.5	1.5	1.0	30.0	60.0	3.5
COLOR	1720.0	1780.0	1690.0	1640.0	2500.0	1640.0
PH	7.8	7.6	7.6	7.6	7.3	7.4
NITROGEN	5.5	2.9				
PHOSPHOR	3.1	1.5				
DO-CONT.		0.7		4.6	0.8	
SS-CONT.		15336.0				
VSS-CONT		7091.3				
SET-BOD			70.0	91.0	113.0	
SLUDGE-SETT		970.0				

DAY 639 IN FILE RECORD 164 DATA FOR 10/ 1/69

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	6.3		3.5	2.0	0.7	
TEMP - C	37.0	30.0	25.0	23.0	29.0	
BOD5	242.0	73.0	40.0	251.0	32.0	48.0
TS	1500.8	1315.0	1206.9	2032.0		1199.0
VTS	613.8	479.9	406.8	840.8		338.9
SS	106.2	118.1	137.9	1004.0	4191.8	164.1
VSS	54.0			559.9	2269.4	106.1
SETT SOL	0.0	0.5	2.0	60.0	350.0	2.0
COLOR	810.0	710.0	510.0	2100.0	9500.0	590.0
PH	8.1	8.2	7.5	7.4	7.1	7.3
NITROGEN	23.1		1.0			
PHOSPHOR	2.5		0.6			
DO-CONT.		0.5		1.7	0.8	
SS-CONT.		7898.2				
VSS-CONT		4003.6				
SET-BOD			29.0	45.0	48.0	
SLUDGE-SETT		540.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 640 IN FILE RECORD 165 DATA FOR 10/ 2/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD DELETE	CL2 DELETE
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	5.8		6.1	2.5	1.6	
TEMP - C	32.0	28.0	27.0	23.0	28.0	
BOD5	235.0	57.0	24.0	90.0	18.0	28.0
TS	1533.9	1172.9	1123.0	1310.8		1083.9
VTS	660.9	450.9	423.0	467.9		372.9
SS	556.0	212.0	109.8	441.8	1601.8	97.9
VSS	357.9				943.8	
SETT SOL	7.0	1.0	1.5	22.0	150.0	0.2
COLOR	1310.0	710.0	400.0	710.0	3200.0	380.0
PH	7.5	7.6	7.6	7.4	7.3	7.5
NITROGEN	1.0			0.2		
PHOSPHOR	1.9			1.7		
DO-CONT.		0.5		3.1	1.7	
SS-CONT.		27407.8				9240.1
VSS-CONT		13122.8				4879.7
SET-BOD			13.0	35.0	28.0	
SLUDGE-SETT		910.0				970.0

DAY 641 IN FILE RECORD 166 DATA FOR 10/ 3/69

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	5.5		7.4	2.2	0.5	
TEMP - C	37.0	30.0	27.0	24.0	29.0	
BOD5	202.0	47.0	15.0	114.0		17.0
TS	1204.9	1144.8	976.1	1354.9		979.9
VTS	619.8	580.7	473.0	611.9		486.8
SS	738.2	501.7	67.7	455.9	3335.8	80.2
VSS	216.0	199.8		265.7	1799.7	
SETT SOL	5.0	4.0	0.5	30.0	460.0	0.2
COLOR	1490.0	1280.0	280.0	1090.0	6200.0	510.0
PH	9.0	7.5	7.7	7.3	7.2	7.4
NITROGEN	12.5					0.8
PHOSPHOR	2.5					1.1
DO-CONT.		0.3		2.1	0.6	
SS-CONT.		14509.8				9284.0
VSS-CONT		6858.8				4706.0
SET-BOD			13.0	24.0	17.0	
SLUDGE-SETT		930.0				950.0

DAY 644 IN FILE RECORD 167 DATA FOR 10/ 6/69

	PF	TF1 DELETE	TF2 DELETE	AL	OD DELETE	CL2 DELETE
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	5.6		7.2	5.0	0.8	
TEMP - C	33.0	27.0	25.0	22.0	26.0	
BOD5	112.0	51.0	20.0	88.0		14.0
TS	1180.8	1275.0	1085.0	1289.0		1073.9
VTS	405.8	378.9	322.0	423.9		350.9
SS	263.9	306.0	114.1	242.0	3771.9	87.8
VSS			50.0		1985.9	
SETT SOL	1.5	1.0	1.0	10.0	490.0	0.2
COLOR	690.0	1310.0	650.0	750.0	7100.0	400.0
PH	9.3	8.0	7.8	7.8	7.4	7.6
NITROGEN	14.3	2.8				
PHOSPHOR	3.2	2.0				
DO-CONT.		0.5		5.2	0.7	
SS-CONT.		15516.0				7703.8
VSS-CONT		7087.7				3989.8
SET-BOD			14.0	22.0	14.0	
SLUDGE-SETT		960.0				940.0

DAY 646 IN FILE RECORD 168 DATA FOR 10/ 8/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	6.8		7.7	5.0	2.6	
TEMP - C	32.0	27.0	23.0	20.0	25.0	
BOD5	123.0	29.0	20.0	75.0		14.0
TS	962.0	892.0	1006.0	1139.0		1023.1
VTS	385.9	277.9	290.9	340.9		279.9
SS	198.0	260.1	93.9	162.0	3175.9	83.9
VSS	151.9				1663.8	
SETT SOL	1.0	0.2	0.7	6.0	430.0	0.2
COLOR	565.0	275.0	320.0	430.0	5900.0	290.0
PH	8.6	8.0	7.1	7.9	7.3	7.4
NITROGEN	13.2					
PHOSPHOR	2.7					
DO-CONT.		0.3		4.9	2.7	
SS-CONT.		35659.8				6622.0
VSS-CONT		16777.9				3369.9
SET-BOD			13.0	41.0	14.0	
SLUDGE-SETT		960.0				930.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
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DAY 647 IN FILE RECORD 169 DATA FOR 10/ 9/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.				3.9	3.5	
TEMP - C				23.0	23.0	
BOD5	141.0	28.0	22.0	144.0	12.0	15.0
TS	812.9	782.0	946.0	1248.9		894.0
VTS	379.9	312.8	366.0	517.9		346.9
SS	92.1	109.8	82.0	335.9	2879.9	50.0
VSS				263.9	1567.8	
SETT SOL	0.2	0.5	0.2	20.0	405.0	0.2
COLOR	400.0	350.0	280.0	1120.0	11000.0	180.0
PH	8.1	7.7	7.8	7.5	7.3	7.4
NITROGEN	5.9		0.0	0.3		
PHOSPHOR	2.9		2.2	2.5		
DO-CONT.				4.1	3.6	
SS-CONT.		14309.9				7760.0
VSS-CONT		6745.7				4081.7
SET-BOD			12.0	77.0	15.0	
SLUDGE-SETT						

DAY 665 IN FILE RECORD 171 DATA FOR 10/27/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	7.2		6.9			
TEMP - C	33.0		32.0			
BOD5	315.0	285.0	262.0	62.0		
TS	1598.9	2236.0	1897.1	1597.9		
VTS	588.8	868.9	744.9	471.8		
SS	221.8	473.9	321.9	366.2		
VSS	81.7	209.9	167.8	182.1		
SETT SOL	1.0	2.0	1.5	25.0		
COLOR	1360.0	1920.0	1920.0	1120.0		
PH	7.1	7.2	7.4	7.5		
NITROGEN	0.0	0.0				
PHOSPHOR	3.4	3.5				
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD				97.0	25.0	
SLUDGE-SETT		258.0				

DAY 648 IN FILE RECORD 170 DATA FOR 10/10/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE				
FEED-GPM		14.8	66.7	32.0	66.7	66.7
DEPTH-FT		24.0	24.0	7.7	8.5	
RECY-GPM		74.0	0.0		30.0	
D.O.	4.4		7.7	5.5	2.6	
TEMP - C	34.0	28.0	24.0	20.0	24.0	
BOD5	127.0	19.0	22.0	80.0	50.0	22.0
TS	902.8	783.9	896.1	1058.0		870.0
VTS	313.8	241.9	274.0	341.9		248.0
SS	114.1	106.2	137.9	198.0	11498.1	110.0
VSS			93.9	138.2	5693.8	85.8
SETT SOL	0.5	0.2	2.0	6.5	900.0	0.2
COLOR	340.0	300.0	320.0	430.0	26000.0	275.0
PH	7.3	7.4	7.7	7.3	7.6	7.5
NITROGEN	4.3					0.0
PHOSPHOR	3.0					1.0
DO-CONT.		0.4		5.5	2.8	
SS-CONT.		12642.2				
VSS-CONT		5977.2				
SET-BOD			16.0	36.0	22.0	
SLUDGE-SETT		930.0				948.0

DAY 667 IN FILE RECORD 172 DATA FOR 10/29/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE				
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.6	3.2	2.9	7.0		
TEMP - C	33.0	24.0	32.0	15.0		
BOD5	256.0	243.0	207.0	193.0		
TS	1818.0	2129.0	1768.9	1950.9		
VTS	750.8	940.8	689.8	829.7		
SS	624.0	539.8	578.0			
VSS	263.9	89.9	361.8			
SETT SOL	3.0	14.0	8.0	35.0		
COLOR	1890.0	1410.0	1250.0	1490.0		
PH	7.4	7.3	7.3	7.4		
NITROGEN	16.1		15.0			
PHOSPHOR	2.1		2.0			
DO-CONT.				7.0		
SS-CONT.						
VSS-CONT						
SET-BOD			153.0	37.0		
SLUDGE-SETT		139.0				

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LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 668 IN FILE RECORD 173 DATA FOR 10/30/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.5	5.9	6.4	6.9		
TEMP - C	34.0	31.0	31.0	15.0		
BOD5	259.0	242.0	271.0	126.0		
TS	1887.0	2084.9	1990.9	925.9		
VTS	770.1	879.8	801.9	659.0		
SS	718.0	787.9	986.0	288.0		
VSS	316.0	379.8	740.0	180.0		
SETT SOL	1.8	6.0	14.0	13.0		
COLOR	1780.0	1640.0	2100.0	1050.0		
PH	7.2	7.1	7.1	7.1		
NITROGEN	13.9			4.9		
PHOSPHOR	2.1			2.0		
DO-CONT.				6.9		
SS-CONT.						
VSS-CONT						
SET-BOD			186.0	38.0		
SLUDGE-SETT		162.0				

DAY 669 IN FILE RECORD 174 DATA FOR 10/31/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE				
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.3	5.4	4.9	7.0		
TEMP - C	34.0	31.0	32.8	16.0		
BOD5	315.0	276.0	269.0	224.0		
TS	2102.9	2302.0	2440.9	1774.9		
VTS	854.8	987.8	980.7	665.9		
SS	1394.0	1549.9	584.1	943.9		
VSS	194.0	495.8	324.0	494.0		
SETT SOL	7.0	12.0	14.0	28.0		
COLOR	2910.0	1980.0	1980.0	1280.0		
PH	7.3	7.0	7.1	7.3		
NITROGEN						
PHOSPHOR						
DO-CONT.				6.9		
SS-CONT.						
VSS-CONT						
SET-BOD			136.0	51.0		
SLUDGE-SETT		142.0				

DAY 672 IN FILE RECORD 175 DATA FOR 11/ 3/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.0	5.7	5.6	7.0		
TEMP - C	34.0	30.0	30.0	14.0		
BOD5	222.0	175.0	219.0	130.0		
TS	1679.9	1616.0	1752.0	2124.9		
VTS	771.7	697.9	734.0	929.8		
SS	354.0	303.9	620.1	840.1		
VSS	267.9		325.8	460.1		
SETT SOL	1.5	5.5	14.0	18.0		
COLOR	1540.0	1010.0	1200.0	950.0		
PH	8.3	7.6	7.4	7.4		
NITROGEN	19.3	18.8				
PHOSPHOR	3.2	2.3				
DO-CONT.				7.1		
SS-CONT.						
VSS-CONT						
SET-BOD			138.0	34.0		
SLUDGE-SETT		139.0				

DAY 674 IN FILE RECORD 176 DATA FOR 11/ 5/69

	PF	TF1	TF2	AL	OD	CL2
		DELETE				
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.6	5.5	5.4	6.0		
TEMP - C	34.0	32.0	32.0	15.0		
BOD5	254.0	407.0	209.0	135.0		
TS	1638.9	3475.0	1855.0	1576.9		
VTS	724.9	1644.7	844.9	716.8		
SS	278.0	2100.2	549.9	375.9		
VSS	114.1	919.8	299.9	195.9		
SETT SOL	0.5	30.0	8.3	17.0		
COLOR	1450.0	3400.0	1540.0	1010.0		
PH	7.1	7.1	7.3	7.3		
NITROGEN	13.6		10.4			
PHOSPHOR	1.9		3.2			
DO-CONT.				6.1		
SS-CONT.						
VSS-CONT						
SET-BOD			169.0	45.0		
SLUDGE-SETT		166.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 675 IN FILE RECORD 177 DATA FOR 11/ 6/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.8	6.1	5.7	5.4		
TEMP - C	34.0	31.0	31.0	15.0		
BOD5	284.0	346.0	219.0	107.0		
TS	3365.0		3365.0	3827.9		
VTS	1894.8		1894.8	2505.7		
SS	199.8		199.8	194.0		
VSS	159.9		159.9	149.8		
SETT SOL	0.6	25.0	3.5	12.0		
COLOR	1450.0			1050.0		
PH	8.0	7.0	7.0	7.2		
NITROGEN	15.3			1.3		
PHOSPHOR	3.7			2.5		
DO-CONT.				5.4		
SS-CONT.						
VSS-CONT						
SET-BOD			166.0			
SLUDGE-SETT		174.0				

DAY 676 IN FILE RECORD 178 DATA FOR 11/ 7/69

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.4			5.0		
TEMP - C	34.0			15.0		
BOD5	297.0		281.0	210.0		
TS	1922.9		2129.9	1696.9		
VTS	648.0		711.8	516.8		
SS	439.7		8343.8	540.1		
VSS	167.8			259.9		
SETT SOL	0.5		8.5	27.0		
COLOR	1780.0		2400.0	1040.0		
PH	7.1		7.1	7.9		
NITROGEN						
PHOSPHOR						
DO-CONT.				5.0		
SS-CONT.						
VSS-CONT						
SET-BOD			251.0	63.0		
SLUDGE-SETT						

DAY 679 IN FILE RECORD 179 DATA FOR 11/10/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.9	5.9	5.8	6.2		
TEMP - C	33.0	32.0	32.0	15.0		
BOD5	325.0	204.0	234.0	139.0		
TS	1932.9	1759.0	1974.9	1784.9		
VTS	854.7	749.8	824.9	694.8		
SS	350.0	400.0	450.1	509.9		
VSS	219.9	230.0	249.9	298.1		
SETT SOL	0.2	3.0	5.0	18.0		
COLOR	1780.0	1090.0	1450.0	1250.0		
PH	6.9	6.8	6.7	6.9		
NITROGEN	8.4	5.9				
PHOSPHOR	3.2	2.3				
DO-CONT.				6.2		
SS-CONT.						
VSS-CONT						
SET-BOD			219.0	29.0		
SLUDGE-SETT		222.0				

DAY 681 IN FILE RECORD 180 DATA FOR 11/12/69

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.2	6.1	5.9	4.6		
TEMP - C	35.0	32.0	32.0	15.0		
BOD5	317.0	219.0	360.0	109.0		
TS	1904.9	1800.0	2342.9	1623.0		
VTS	679.8	635.0	1871.8	494.8		
SS	370.1	299.9	1119.9	359.8		
VSS	176.0	140.0	579.8	179.7		
SETT SOL	0.7	2.5	17.0	16.0		
COLOR	1610.0	1780.0	2400.0	1280.0		
PH	6.8	6.9	6.9	7.0		
NITROGEN	12.4		7.1			
PHOSPHOR	4.0		3.4			
DO-CONT.				4.5		
SS-CONT.						
VSS-CONT						
SET-BOD			248.0	50.0		
SLUDGE-SETT		198.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 682 IN FILE RECORD 181 DATA FOR 11/13/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.0	6.1	5.9	5.5		
TEMP - C	35.0	32.0	32.0	15.0		
BOD5	198.0	210.0	231.0	122.0		
TS	2350.0	1607.9	1829.9	1735.0		
VTS	1074.8	509.8	1285.9	664.8		
SS	859.9	404.0	550.2	349.7		
VSS	198.0	180.0	270.0	171.7		
SETT SOL	57.0	2.0	5.0	17.0		
COLOR	1890.0	1640.0	1600.0	990.0		
PH	9.5	8.6	7.6	7.4		
NITROGEN				3.1		
PHOSPHOR				1.8		
DO-CONT.				5.5		
SS-CONT.						
VSS-CONT						
SET-BOD			186.0	46.0		
SLUDGE-SETT		197.0				

DAY 683 IN FILE RECORD 182 DATA FOR 11/14/69

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	6.1	2.0	2.5	7.4		
TEMP - C	29.0	24.0	25.0	15.0		
BOD5	311.0	204.0	249.0	160.0		
TS	2010.0	1788.0	1940.0	1729.8		
VTS	744.9	589.8	674.9	524.8		
SS	449.8		401.9	319.8		
VSS	176.0		161.7	199.8		
SETT SOL	0.5	0.4	2.0	23.0		
COLOR	2300.0	1640.0	2020.0	1050.0		
PH	8.1	7.5	7.6	7.2		
NITROGEN						
PHOSPHOR						
DO-CONT.				7.5		
SS-CONT.						
VSS-CONT						
SET-BOD			264.0	40.8		
SLUDGE-SETT		223.0				

DAY 686 IN FILE RECORD 183 DATA FOR 11/17/69

	PF	TF1 DELETE	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.4	6.1	6.2	7.0		
TEMP - C	34.0	32.0	32.0	16.0		
BOD5	344.0	280.0	387.0	65.0		
TS	2094.8	2153.0	2490.0	1580.0		
VTS	754.9	727.9	938.0	467.8		
SS	433.9	606.0	1050.1	169.9		
VSS	214.2	296.0	529.9	130.0		
SETT SOL	0.6	1.8	11.0	18.5		
COLOR	1920.0	2200.0	2850.0	1280.0		
PH	8.6	8.1	8.0	7.7		
NITROGEN	10.1	6.2				
PHOSPHOR	1.6	1.1				
DO-CONT.				7.0		
SS-CONT.						
VSS-CONT						
SET-BOD			297.0	46.0		
SLUDGE-SETT		272.0				

DAY 688 IN FILE RECORD 184 DATA FOR 11/19/69

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.						
TEMP - C						
BOD5	272.0	191.0	218.0	205.0		
TS	1812.1	1651.9	1569.9	2209.9		
VTS	706.9	583.9	530.0	834.9		
SS	531.9	390.0	275.6	890.1		
VSS	243.8	259.9	180.0	550.2		
SETT SOL	3.5	5.5	2.5	70.0		
COLOR	2150.0	1450.0	1310.0	2400.0		
PH	8.3	7.7	7.0	7.1		
NITROGEN			9.3			
PHOSPHOR			1.5			
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			415.0	69.0		
SLUDGE-SETT		171.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 689 IN FILE RECORD 185 DATA FOR 11/20/69

	PF	TF1	TF2	AL	OD	CL2
	DELETE	DELETE	DELETE	DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.9	6.8	6.8	7.3		
TEMP - C	32.0	28.0	28.0	15.0		
BOD5	493.0	212.0	376.0	113.0		
TS	2785.0	1828.0	784.9	1910.0		
VTS	2469.7	1659.8	642.9	679.9		
SS	914.0	520.0	956.1	1099.8		
VSS				750.0		
SETT SOL	0.3	1.3	1.4	18.0		
COLOR	3500.0	2850.0	3005.0	1920.0		
PH	8.7	8.7	8.4	7.8		
NITROGEN	17.9			5.8		
PHOSPHOR	2.1			1.3		
DO-CONT.				7.2		
SS-CONT.						
VSS-CONT						
SET-BOD			376.0	60.0		
SLUDGE-SETT		240.0				

DAY 690 IN FILE RECORD 186 DATA FOR 11/21/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.9	6.7	6.8	7.1		
TEMP - C	31.0	26.0	26.0	15.0		
BOD5	105.0	136.0	145.0	126.0		
TS	11060.9	1539.0	1555.0	1820.0		
VTS	10084.2	557.8	559.9	669.9		
SS	249.9	216.0	79.9	480.0		
VSS		111.9	39.9	263.9		
SETT SOL	0.4	1.0	1.0	2.5		
COLOR	1450.0	1310.0	1250.0	1890.0		
PH	7.1	7.2	7.1	7.2		
NITROGEN						
PHOSPHOR						
DO-CONT.				7.1		
SS-CONT.						
VSS-CONT						
SET-BOD			310.0			
SLUDGE-SETT		168.0				

DAY 700 IN FILE RECORD 187 DATA FOR 12/ 1/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.2	6.2	6.2	6.4		
TEMP - C	32.0	29.0	29.0	15.0		
BOD5	238.0	185.0	177.0	372.0		
TS	1782.9	1204.9	1636.9	2967.9		
VTS	704.8	1204.9	596.8	1209.7		
SS	260.0	279.8	383.9	1760.2		
VSS	110.1		176.0	819.9		
SETT SOL	0.2	4.0	2.5	85.0		
COLOR	1540.0	1490.0	1360.0	1450.0		
PH	7.4	7.6	7.5	7.5		
NITROGEN	16.4	13.2				
PHOSPHOR	1.3	2.0				
DO-CONT.				6.4		
SS-CONT.						
VSS-CONT						
SET-BOD			144.0	45.0		
SLUDGE-SETT		169.0				

DAY 702 IN FILE RECORD 188 DATA FOR 12/ 3/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.8	5.3	5.4	6.2		
TEMP - C	32.0	29.0	29.0	15.0		
BOD5	356.0	202.0	324.0	132.0		
TS	1880.0	1755.9	2374.8	1975.0		
VTS	679.8	587.9	894.8	674.0		
SS	205.9	243.8	959.7	578.0		
VSS	109.8	133.9	455.8	280.0		
SETT SOL	1.0	1.5	18.0	30.0		
COLOR	1780.0	1640.0	2200.0	1120.0		
PH	7.4	7.6	7.5	7.6		
NITROGEN	14.0		7.8			
PHOSPHOR	3.5		3.9			
DO-CONT.				6.1		
SS-CONT.						
VSS-CONT						
SET-BOD			197.0	38.0		
SLUDGE-SETT		204.0				

SHEET 47

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 703 IN FILE RECORD 189 DATA FOR 12/ 4/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.8	6.2	6.4	7.3		
TEMP - C	31.0		28.0	15.0		
BOD5	285.0	198.0	489.0	163.0		
TS	1669.9	1638.0	3097.9	1828.0		
VTS	579.9	585.9	1201.7	579.8		
SS	308.2	136.1	1823.7	726.0		
VSS	120.2	50.0	809.9	306.0		
SETT SOL	0.2	2.0	26.0	29.0		
COLOR	1920.0	1850.0	2100.0	1440.0		
PH	8.5	8.0	7.8	7.6		
NITROGEN	21.2			6.7		
PHOSPHOR	4.2			1.9		
DO-CONT.				7.3		
SS-CONT.						
VSS-CONT						
SET-BOD			191.0	43.0		
SLUDGE-SETT		185.0				

DAY 704 IN FILE RECORD 190 DATA FOR 12/ 5/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	4.9	5.5	5.7	7.6		
TEMP - C	30.0	26.0	26.0	15.0		
BOD5	344.0	166.0	177.0	100.0		
TS	1578.0	1755.0	1797.0	1944.8		
VTS	519.9	524.9	1531.9	584.8		
SS	440.0	468.1	520.0	737.9		
VSS	216.0	220.0	239.8	383.8		
SETT SOL	0.2	2.1	4.0	20.0		
COLOR	1540.0	1600.0	1450.0	1280.0		
PH	6.6	7.0	7.4	7.7		
NITROGEN						
PHOSPHOR						
DO-CONT.				7.5		
SS-CONT.						
VSS-CONT						
SET-BOD			155.0	46.0		
SLUDGE-SETT		155.0				

DAY 707 IN FILE RECORD 191 DATA FOR 12/ 8/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.0	5.3	6.8	6.2		
TEMP - C	32.0	30.0	30.0	16.0		
BOD5	329.0	252.0	246.0	78.0		
TS	1990.0	1959.9	1963.0	1492.0		
VTS	640.0	574.8	594.9	341.8		
SS	520.0	373.8	509.9	265.8		
VSS	180.0	119.9	169.9			
SETT SOL	6.5	8.0	8.0	12.5		
COLOR	1360.0	1540.0	1410.0	910.0		
PH	7.3	7.2	7.2	7.1		
NITROGEN	2.9	1.1				
PHOSPHOR	0.8	0.4				
DO-CONT.				6.1		
SS-CONT.						
VSS-CONT						
SET-BOD			208.0	34.0		
SLUDGE-SETT		214.0				

DAY 709 IN FILE RECORD 192 DATA FOR 12/10/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.						
TEMP - C						
BOD5	309.0	264.0	331.0	116.0		
TS	2008.9	2077.0	2223.0	1725.0		
VTS	719.8	714.9	794.9	519.9		
SS	364.0	464.1	2344.0	319.8		
VSS	244.1	290.1	393.8	259.9		
SETT SOL	2.5	7.0	16.0	15.0		
COLOR	2100.0	2200.0	2480.0	1010.0		
PH	8.6	8.5	8.6	8.0		
NITROGEN	33.6		30.4			
PHOSPHOR	2.7		4.3			
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			236.0	50.0		
SLUDGE-SETT		234.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 710 IN FILE RECORD 193 DATA FOR 12/11/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.2	5.7	6.0	6.2		
TEMP - C	29.0	27.0	28.0	15.0		
BOD5	252.0	205.0	159.0	92.0		
TS	1826.0	1654.9	1410.0	1629.9		
VTS	615.0	522.8	402.8	446.7		
SS	393.9	404.0	173.9	195.9		
VSS	190.0	180.0	79.9	108.0		
SETT SOL	6.0	0.1	8.0	11.0		
COLOR	1250.0	1090.0	1120.0	990.0		
PH	6.4	6.6	7.1	7.1		
NITROGEN	4.4			5.7		
PHOSPHOR				2.6		
DO-CONT.				6.2		
SS-CONT.						
VSS-CONT						
SET-BOD			160.0	47.0		
SLUDGE-SETT		168.0				

DAY 711 IN FILE RECORD 194 DATA FOR 12/12/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.1	6.1	6.2	7.4		
TEMP - C	30.0	28.0	28.0	12.0		
BOD5	262.0	180.0	188.0	40.0		
TS	1907.9	1750.0	1759.9	1398.0		
VTS	657.8	544.9	569.8	337.8		
SS	414.1	299.9	293.8	110.1		
VSS	263.9		183.9	90.0		
SETT SOL	6.0	6.6	6.9	7.0		
COLOR	1360.0	1280.0	1450.0	810.0		
PH	6.2	6.6	6.9	7.0		
NITROGEN						
PHOSPHOR						
DO-CONT.				7.4		
SS-CONT.						
VSS-CONT						
SET-BOD			163.0	40.0		
SLUDGE-SETT		168.0				

DAY 714 IN FILE RECORD 195 DATA FOR 12/15/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.1	6.2	6.1	7.0		
TEMP - C	30.0	26.0	27.0	16.0		
BOD5	300.0	162.0	183.0	98.0		
TS	1620.0	1609.9	1689.9	1679.9		
VTS	869.9	549.7	599.9	532.0		
SS	249.9	266.1	249.9	279.8		
VSS		190.1				
SETT SOL	0.1	1.4	3.0	17.0		
COLOR	1490.0	1450.0	1410.0	1010.0		
PH	8.0	7.7	7.6	7.4		
NITROGEN	15.0	9.4				
PHOSPHOR	5.1	3.9				
DO-CONT.				7.1		
SS-CONT.						
VSS-CONT						
SET-BOD			153.0	42.0		
SLUDGE-SETT		155.0				

DAY 716 IN FILE RECORD 196 DATA FOR 12/17/69

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.8	6.1	6.2	6.1		
TEMP - C	30.0	27.0	27.0	15.0		
BOD5	277.0	198.0	203.0	118.0		
TS	1808.0	1748.0	1781.9	1864.9		
VTS	606.9	545.0	549.9	579.8		
SS	190.1	220.0	2143.8			
VSS						
SETT SOL	0.5	3.0	3.0	20.0		
COLOR	1920.0	1640.0	1720.0	1310.0		
PH	7.5	7.4	7.5	7.4		
NITROGEN	9.9		6.6			
PHOSPHOR	7.4		7.6			
DO-CONT.				6.1		
SS-CONT.						
VSS-CONT						
SET-BOD			192.0	39.0		
SLUDGE-SETT		198.0				

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 717 IN FILE RECORD 197 DATA FOR 12/18/69

	PF	TF1	TF2	AL	OD	CL2
FEED-GPM		66.7	66.7	40.0		
DEPTH-FT		24.0	24.0	5.5		
RECY-GPM		0.0	0.0			
D.O.	5.7	6.9	6.8	6.2		
TEMP - C	30.0	26.0	26.0	15.0		
BOD5	246.0	195.0	206.0	79.0		
TS	1754.9	1604.0	1685.0	1762.0		
VTS	599.8	371.9	514.9	585.0		
SS	239.8	169.9	204.1	260.0		
VSS	90.0	86.0	60.1	149.8		
SETT SOL	0.1	0.9	2.5	17.0		
COLOR	1720.0	1450.0	1640.0	950.0		
PH	7.1	7.4	7.7	7.6		
NITROGEN	12.9			6.1		
PHOSPHOR	6.1			3.8		
DO-CONT.				6.1		
SS-CONT.						
VSS-CONT						
SET-BOD			191.0	28.0		
SLUDGE-SETT		183.0				

DAY 749 IN FILE RECORD 198 DATA FOR 1/19/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.						
TEMP - C						
BOD5	356.0		238.0	119.0		104.0
TS	2232.0		1943.0	1849.9		1721.0
VTS	863.8		680.8	604.9		523.8
SS	646.0		624.0	496.2		321.9
VSS	319.7		294.1	285.9		195.9
SETT SOL	1.5		0.5	1.5	30.0	0.2
COLOR	3005.0		2300.0	1640.0	1640.0	1890.0
PH	9.1		8.7	8.2	7.7	7.5
NITROGEN	23.0		18.0			
PHOSPHOR	7.6		9.7			
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			228.0	109.0	104.0	
SLUDGE-SETT						

DAY 751 IN FILE RECORD 199 DATA FOR 1/21/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.						
TEMP - C						
BOD5	214.0		163.0	36.0		47.0
TS	1625.9		1860.0	1511.0		1613.0
VTS	517.8		601.9	440.9		474.0
SS	421.7		484.0	243.8		310.0
VSS	197.7		252.0	176.0		217.8
SETT SOL	2.5		2.0	0.2		0.4
COLOR	1720.0		1820.0	1250.0		1490.0
PH	7.8		8.1	7.7		7.7
NITROGEN	16.2			4.5		
PHOSPHOR	9.7			4.8		
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			144.0	9.0	47.0	
SLUDGE-SETT						

DAY 758 IN FILE RECORD 200 DATA FOR 1/28/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	1.0		3.2	6.1	6.4	
TEMP - C	31.0		28.0	14.0	11.0	
BOD5	554.0	128.0	441.0	123.0		128.0
TS	2957.9	1879.8	1915.8			1846.0
VTS	1328.6	634.8	677.8			614.9
SS	871.8	137.9	82.0			199.8
VSS	447.9	47.9	46.0			101.9
SETT SOL	0.0	0.0	0.5	0.2	12.0	0.5
COLOR	5400.0	2400.0	3850.0	2550.0	3100.0	2350.0
PH	9.2	8.2	9.0	8.4	8.0	7.7
NITROGEN	22.0					
PHOSPHOR						
DO-CONT.				6.0	6.8	
SS-CONT.						
VSS-CONT						
SET-BOD			676.0	114.0	128.0	
SLUDGE-SETT						

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 759 IN FILE RECORD 201 DATA FOR 1/29/70

	PF	TF1	TF2	AL	OD	CL2
	DELETE					
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	4.0		3.0	1.0	5.4	
TEMP - C	33.0	18.0	22.0	18.0	18.0	
BOD5	185.0	94.0	557.0	190.0		114.0
TS	2781.0	1456.0	2765.0	2295.9		2003.0
VTS	1295.9	723.9	1199.7	920.0		734.9
SS	740.0	388.1	759.8	671.9	612.1	356.1
VSS	377.7	183.9	397.8	455.8	400.0	270.0
SETT SOL	0.2	0.2	1.5	6.0	6.5	0.5
COLOR	5180.0	2550.0	4600.0	3500.0	2910.0	2550.0
PH	9.1	8.0	8.4	7.8	7.7	7.7
NITROGEN	22.7			4.5		
PHOSPHOR						
DO-CONT.		1.0		0.3	5.5	
SS-CONT.						
VSS-CONT						
SET-BOD			505.0	157.0	114.0	
SLUDGE-SETT						

DAY 760 IN FILE RECORD 202 DATA FOR 1/30/70

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	5.5		9.4	7.0	8.2	
TEMP - C	30.0	11.0	25.0	16.0	16.0	
BOD5	569.0		127.0	78.0		166.0
TS	2891.0		1528.9	1813.0		2635.9
VTS	1374.9		551.7	603.0		990.8
SS	820.0		520.0	402.2		981.7
VSS	476.0		254.1	250.2		565.7
SETT SOL	1.0		4.0	0.5	28.0	17.0
COLOR	5180.0		2020.0	2200.0	5000.0	4790.0
PH	9.6		8.7	8.0	7.9	8.1
NITROGEN	26.4					6.6
PHOSPHOR						
DO-CONT.		1.0		8.3	8.3	
SS-CONT.						
VSS-CONT						
SET-BOD			167.0	78.0	166.0	
SLUDGE-SETT						

DAY 763 IN FILE RECORD 203 DATA FOR 2/ 2/70

	PF	TF1	TF2	AL	OD	CL2
	DELETE					
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.						
TEMP - C						
BOD5	603.0	72.0	541.0	238.0		76.0
TS	3321.0	2026.9	3108.9			2141.1
VTS	1518.0	675.7	1357.9			718.9
SS	858.1	280.1	645.7		505.9	173.9
VSS	512.0	198.0	389.9		334.1	122.0
SETT SOL	0.5	0.0	0.2	0.5	4.0	0.5
COLOR	5650.0	2550.0	4000.0	3980.0	3005.0	3005.0
PH	9.6	8.1	8.9	8.0	7.7	7.7
NITROGEN	22.9			0.0		
PHOSPHOR						
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			653.0	177.0	76.0	
SLUDGE-SETT						

DAY 765 IN FILE RECORD 204 DATA FOR 2/ 4/70

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	5.0		9.0	6.5	7.2	
TEMP - C	29.0		23.0	12.0	15.0	
BOD5	618.0		208.0	169.0		
TS	3213.0		1880.0	2749.9		
VTS	1388.9		584.8	1007.8		
SS	629.8		487.9	760.1	655.8	
VSS	403.6		281.9	542.2	445.8	
SETT SOL	0.5		1.0	5.0	8.0	
COLOR	5000.0		2150.0	3980.0	3005.0	
PH	9.3		8.7	7.9	8.6	
NITROGEN	31.9					
PHOSPHOR	0.6					
DO-CONT.				8.4	7.3	
SS-CONT.						
VSS-CONT						
SET-BOD			208.0	128.0		
SLUDGE-SETT						

SHEET 52 LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 767 IN FILE RECORD 205 DATA FOR 2/ 6/70

	PF DELETE	TF1	TF2	AL	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	0.0		7.6	3.0		
TEMP - C	28.0		27.0	13.0	17.0	
BOD5	733.0		603.0	85.0		
TS	3565.0		3374.9	2062.9		
VTS	1519.7		1419.8	709.8		
SS	823.9		854.1	386.0		
VSS	553.8		482.0	277.9		
SETT SOL	0.2		0.5	0.2		
COLOR	5900.0		5100.0	2695.0		
PH	9.8		9.4	8.4		
NITROGEN	38.6		34.2			
PHOSPHOR	9.2		8.2			
DO-CONT.				4.2	5.5	
SS-CONT.						
VSS-CONT						
SET-BOD			558.0	89.0		
SLUDGE-SETT						

DAY 770 IN FILE RECORD 206 DATA FOR 2/ 9/70

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	4.5	3.7	3.8	7.0	5.5	
TEMP - C	29.0	25.0	27.0	14.0	18.0	
BOD5	490.0	100.0	381.0	143.0		95.0
TS	2702.9	2423.8	2635.0	2375.9		2489.0
VTS	1204.9	910.8	1137.8	991.0		833.8
SS	628.0	543.8	615.8	898.1	653.9	652.1
VSS	371.9	369.8	343.8	505.9	443.9	479.9
SETT SOL	0.1	0.2	1.0	6.5	5.0	0.1
COLOR	4790.0	3000.0	3800.0	3720.0	3600.0	3200.0
PH	9.8	8.5	9.4	8.5	8.1	8.1
NITROGEN	35.8	3.1				
PHOSPHOR	4.2	7.7				
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			400.0	106.0	95.0	
SLUDGE-SETT						

DAY 772 IN FILE RECORD 207 DATA FOR 2/11/70

	PF DELETE	TF1	TF2	AL	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	4.8	1.3	9.8	7.1	12.0	
TEMP - C	30.0	4.0	27.0	9.0	8.0	
BOD5	241.0	141.0	278.0	88.0		88.0
TS	1894.0	2298.8	1880.0	2216.0		2206.8
VTS	657.2	810.8	652.9	782.9		785.8
SS	401.9	321.9	461.7	310.0	1228.0	458.0
VSS	153.7	244.1	183.6	230.0	661.9	294.1
SETT SOL	0.1	0.1	0.7	0.1	30.0	1.4
COLOR	2480.0	3000.0	2480.0	3300.0	5000.0	3200.0
PH	8.2	8.4	8.3	8.2	7.8	7.9
NITROGEN	1.5		1.3			
PHOSPHOR	0.8		0.7			
DO-CONT.				9.6	12.0	
SS-CONT.						
VSS-CONT						
SET-BOD			304.0	100.0	88.0	
SLUDGE-SETT						

DAY 773 IN FILE RECORD 208 DATA FOR 2/12/70

	PF	TF1	TF2 DELETE	AL	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	5.7	6.5	10.0	8.6	11.0	
TEMP - C	29.0	4.0	24.0	11.0	8.0	
BOD5	234.0	59.0	161.0	61.0		50.0
TS	1699.9	1903.9	1712.9	2039.9		1866.9
VTS	582.7	657.8	556.8	846.9		626.9
SS	396.1	333.8	437.9	346.0	859.9	283.8
VSS	180.0	245.9	207.7	241.9	487.9	235.8
SETT SOL	0.2	0.0	0.5	0.1	15.0	0.0
COLOR	2020.0	2480.0	1920.0	2780.0	3100.0	2480.0
PH	7.4	7.8	7.9	8.0	8.0	8.1
NITROGEN	2.7			11.5		
PHOSPHOR	9.6			3.0		
DO-CONT.				9.5	11.5	
SS-CONT.						
VSS-CONT						
SET-BOD			171.0	52.0	50.0	
SLUDGE-SETT						

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DAY 774 IN FILE RECORD 209 DATA FOR 2/13/70

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.		9.6	9.6	9.7	12.0	
TEMP - C		4.0	20.0	9.0	9.0	
BOD5	248.0	53.0	207.0	60.0		52.0
TS	1841.8	1770.9	1791.9	1990.0		1828.9
VTS	828.8	655.9	731.8	839.8		711.8
SS	545.9	323.7	487.9	364.0	995.7	356.1
VSS	226.0	220.0	215.7	241.0	505.9	205.9
SETT SOL	2.0	0.3	3.0	0.2	14.0	0.2
COLOR	3300.0	3200.0	2100.0	2600.0	3850.0	2600.0
PH	7.8	7.9	8.0	8.1	8.0	8.0
NITROGEN	1.1					3.2
PHOSPHOR	1.1					6.4
DO-CONT.				10.9	12.0	
SS-CONT.						
VSS-CONT						
SET-BOD			170.0	39.0	52.0	
SLUDGE-SETT						

DAY 779 IN FILE RECORD 210 DATA FOR 2/18/70

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	0.7	1.2	9.0	7.5	5.9	
TEMP - C	30.0	12.0	27.0	8.0	14.0	
BOD5	1124.0	96.0	961.0	177.0		139.0
TS	4604.0	2205.0	4633.9	2174.0		2105.1
VTS	2427.7	892.8	2544.9	877.8		820.9
SS	1857.9	429.9	1322.0		923.7	1678.1
VSS	1053.6	285.9	769.9		563.9	294.1
SETT SOL	0.0	1.5	1.5	0.5	23.0	0.0
COLOR	8500.0	2150.0	8500.0	3100.0	3850.0	2430.0
PH	10.2	9.1	9.7	8.7	8.2	7.9
NITROGEN	19.2		18.1			
PHOSPHOR	4.4		6.5			
DO-CONT.				8.1	5.9	
SS-CONT.						746.1
VSS-CONT						443.9
SET-BOD			961.0	168.0	139.0	
SLUDGE-SETT						10.0

DAY 780 IN FILE RECORD 211 DATA FOR 2/19/70

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	0.2	1.0	8.0	1.3	4.1	
TEMP - C	29.0	14.0	24.0	12.0	17.0	
BOD5	712.0	100.0	676.0	295.0		112.0
TS	3722.0	2259.9	3643.9	2630.0		2407.9
VTS	1991.6	870.7	1961.9	1119.8		984.8
SS	632.0	194.0	671.9	146.1	476.0	418.0
VSS	379.9	163.8	422.0	114.1	333.8	316.1
SETT SOL	0.0	0.0	0.5	0.2	3.0	0.0
COLOR	7100.0	2850.0	7100.0	4310.0	2900.0	3005.0
PH	10.2	8.6	9.7	8.8	8.3	8.1
NITROGEN	19.8			12.3		
PHOSPHOR	15.6			4.4		
DO-CONT.				2.2	4.7	
SS-CONT.						1007.9
VSS-CONT						568.2
SET-BOD			556.0	241.0	112.0	
SLUDGE-SETT						20.0

DAY 781 IN FILE RECORD 212 DATA FOR 2/20/70

	PF	TF1	TF2	AL	OD	CL2
			DELETE			
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	0.7	4.7	9.0	3.4	5.1	
TEMP - C	29.0	14.0	23.0	11.0	16.0	
BOD5	651.0	137.0	590.0	224.0		124.0
TS	3265.9	2444.0	3064.8	2724.9		2570.9
VTS	1566.6	972.9	1472.6	1140.9		1062.8
SS	783.9	411.9	611.8	533.7	1836.2	455.9
VSS	478.1	314.0	390.0	381.7	1130.0	337.7
SETT SOL	0.2	0.2	0.3	0.2	55.0	0.2
COLOR	5650.0	3000.0	4000.0	3000.0	4900.0	4900.0
PH	8.8	8.1	8.4	8.3	7.8	7.8
NITROGEN	10.6					0.8
PHOSPHOR	2.1					6.2
DO-CONT.				5.2	5.6	
SS-CONT.						1044.0
VSS-CONT						599.8
SET-BOD			594.0	256.0	124.0	
SLUDGE-SETT						30.0

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DAY 784 IN FILE RECORD 213 DATA FOR 2/23/70

	PF	TF1 DELETE	TF2 DELETE	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	4.7	1.1	4.0	5.3	8.2	
TEMP - C	30.0	16.0	26.0	11.0	15.0	
BOD5	101.0	90.0	156.0	106.0		107.0
TS	1242.0	2266.0	1439.9	2449.0		2541.9
VTS	384.9	937.9	487.8	1124.8		1140.8
SS	342.1	316.1	406.1	433.9		530.0
VSS	108.0	216.0	146.1	296.0		339.9
SETT SOL	0.1	0.0	0.3	0.8		2.5
COLOR	1310.0	2800.0	2020.0	3200.0		3720.0
PH	8.3	7.8	8.3	7.6	7.5	7.4
NITROGEN	97.8		61.8			
PHOSPHOR	7.1		9.2			
DO-CONT.				5.8	8.2	
SS-CONT.						
VSS-CONT						
SET-BOD			172.0	109.0	107.0	
SLUDGE-SETT						

DAY 791 IN FILE RECORD 214 DATA FOR 3/ 2/70

	PF	TF1 DELETE	TF2 DELETE	AL	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.						
TEMP - C						
BOD5	221.0	32.0	161.0	94.0		31.0
TS	1799.0	1613.0	1627.9	1763.9		1632.9
VTS	684.8	622.9	726.8	639.9		546.8
SS	620.1	231.9	408.0	315.8	1359.8	288.0
VSS	262.1	143.7	184.0	202.0	721.9	181.8
SETT SOL	0.4	0.1	0.9	2.5	35.0	0.2
COLOR	2780.0	1540.0	1890.0	1890.0	3720.0	1780.0
PH	8.7	7.7	7.6	7.4	7.4	7.5
NITROGEN	20.7	11.2				
PHOSPHOR	8.6	5.0				
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			65.0	84.0	31.0	
SLUDGE-SETT						

DAY 793 IN FILE RECORD 215 DATA FOR 3/ 4/70

	PF	TF1 DELETE	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.						
TEMP - C						
BOD5	449.0	34.0	335.0	57.0		4.0
TS	2400.9	1364.8	2167.0	1835.0		1436.0
VTS	1195.9	431.8	1016.9	649.9		497.8
SS	544.1	144.0	507.8	525.8	3719.7	187.9
VSS	310.0	87.8	297.8	293.8	1929.8	105.8
SETT SOL	0.4	1.0	2.0	7.5	150.0	1.4
COLOR	3840.0	1090.0	3500.0	2150.0	8500.0	1160.0
PH	9.3	7.8	8.6	7.7	7.4	7.5
NITROGEN	21.1		12.8			
PHOSPHOR	6.7		6.0			
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			292.0	30.0	4.0	
SLUDGE-SETT						

DAY 794 IN FILE RECORD 216 DATA FOR 3/ 5/70

	PF	TF1 DELETE	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	0.3	1.3	9.8	7.6	7.9	
TEMP - C	28.0	16.0	25.0	16.0	14.0	
BOD5	523.0	23.0	423.0	38.0		0.0
TS	2708.1	1277.9	2526.0	1535.0		1228.0
VTS	1308.0	414.9	1190.7	526.9		349.9
SS	810.2	133.9	829.7	193.7	1705.9	88.1
VSS	458.0	104.0	453.7	144.0	931.9	82.0
SETT SOL	0.5	0.5	5.0	2.0	50.0	0.2
COLOR	4500.0	950.0	4600.0	1820.0	4250.0	950.0
PH	9.8	8.7	8.5	7.8	7.8	7.8
NITROGEN				11.6		
PHOSPHOR	4.7			6.3		
DO-CONT.				9.0	7.9	
SS-CONT.						
VSS-CONT						
SET-BOD			378.0	8.0	0.0	
SLUDGE-SETT						

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DAY 795 IN FILE RECORD 217 DATA FOR 3/ 6/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	66.7	33.3	33.3	33.3
DEPTH-FT		24.0	24.0	5.0	4.3	
RECY-GPM		0.0	0.0		30.0	
D.O.	0.2		3.5	3.4	4.2	
TEMP - C	31.0	17.0	28.0	15.0	15.0	
BOD5	616.0	82.0	571.0	89.0		33.0
TS	3256.0	1711.1	3200.9	1871.9		1428.9
VTS	1574.9	591.8	1441.7	686.8		411.9
SS	899.9	280.1	1103.8	634.1	707.7	230.1
VSS	503.7	184.0	603.8	362.2	491.9	146.1
SETT SOL	3.0	0.0	9.0	7.0	25.0	0.2
COLOR	4900.0	1980.0	5100.0	2400.0	2900.0	1450.0
PH	7.3	9.2	8.8	7.8	7.6	7.5
NITROGEN	23.2					4.9
PHOSPHOR	8.9					5.5
DO-CONT.		3.2		4.2	4.4	
SS-CONT.						
VSS-CONT						
SET-BOD			571.0	50.0	33.0	
SLUDGE-SETT						

DAY 801 IN FILE RECORD 218 DATA FOR 3/12/70

	PF	TF1 DELETE	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.						
TEMP - C						
BOD5	615.0		512.0	119.0		
TS	2732.0	2482.9	2817.0	2133.9		
VTS	1186.8	1041.8	1309.9	888.7		
SS	651.8	402.2	576.1	321.9	1014.0	
VSS	331.9	212.0	312.1	229.7	590.2	
SETT SOL	2.0	0.0	1.5	0.1	26.0	
COLOR	5180.0	3500.0	4000.0	2250.0	3000.0	
PH	9.6	8.9	9.3	8.4	8.1	
NITROGEN	84.2		28.9			
PHOSPHOR	21.8		8.0			
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			542.0	109.0		
SLUDGE-SETT						

DAY 805 IN FILE RECORD 219 DATA FOR 3/16/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	7.4		8.2	1.0	7.9	
TEMP - C	27.0	22.0	24.0	14.0	14.0	
BOD5	510.0	257.0	390.0	100.0		
TS	2640.9	2381.1	2507.0	2115.0		
VTS	1140.9	982.9	1065.7	746.8		
SS	498.0	441.8	598.1	358.2	545.9	
VSS	280.1	263.9	330.1	280.1	289.8	
SETT SOL	0.2	0.5	1.0	0.0	2.0	
COLOR	4600.0	3600.0	4250.0	2780.0	2695.0	
PH	9.6	8.9	9.2	8.3	8.0	
NITROGEN	27.7	13.6				
PHOSPHOR	4.8	3.1				
DO-CONT.		0.9		1.0	7.9	
SS-CONT.						
VSS-CONT						
SET-BOD			390.0	147.0		
SLUDGE-SETT						

DAY 809 IN FILE RECORD 220 DATA FOR 3/20/70

	PF	TF1 DELETE	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.						
TEMP - C						
BOD5	646.0	297.0	435.0	89.0		97.0
TS	3054.0	2512.0	5830.0	2031.0		1840.0
VTS	1449.7	1064.8	1277.9	761.8		653.9
SS	1072.0	547.7	650.0	350.0	247.8	257.8
VSS	437.8	325.8	364.0	241.9	165.7	151.9
SETT SOL	0.0	1.2	0.5	0.7	4.0	1.0
COLOR	4900.0	4600.0	4500.0	2400.0	2350.0	2300.0
PH	9.4	8.3	8.9	7.5	7.7	7.8
NITROGEN	16.4		15.1			
PHOSPHOR	4.2		3.6			
DO-CONT.						
SS-CONT.						
VSS-CONT						
SET-BOD			500.0	96.0	97.0	
SLUDGE-SETT						

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DAY 812 IN FILE RECORD 221 DATA FOR 3/23/70

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.6		5.3	1.2	6.5	
TEMP - C	30.0	27.0	28.0	17.0	18.0	
BOD5	402.0	247.0	329.0	55.0		53.0
TS	2378.9	2164.0	2300.8	2069.0		2032.0
VTS	1056.7	857.8	951.8	848.9		735.9
SS	640.2	520.0	656.1	316.1	538.0	267.9
VSS	356.1	321.9	385.9	232.2	320.1	196.2
SETT SOL	0.1	0.5	2.0	0.3	9.0	0.2
COLOR	3850.0	3500.0	3850.0	2200.0	3005.0	2910.0
PH	9.3	8.4	8.7	7.9	7.8	7.8
NITROGEN	10.4	2.2				
PHOSPHOR	8.8	7.1				
DO-CONT.		0.5				
SS-CONT.				1.0	6.6	
VSS-CONT						902.0
SET-BOD						553.8
SLUDGE-SETT			264.0	61.0	53.0	

DAY 814 IN FILE RECORD 222 DATA FOR 3/25/70

	PF	TF1	TF2	AL	OD	CL2
		DELETE		DELETE	DELETE	DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.						
TEMP - C						
BOD5	504.0	279.0	494.0	53.0		121.0
TS	2626.0	2606.0	2577.9	2168.1		2138.0
VTS	1179.8	1197.9	1169.8	924.9		836.8
SS	807.8	620.1	753.7	310.0	903.9	440.0
VSS	495.9	436.0	484.0	289.8	595.6	339.9
SETT SOL	0.0	1.0	1.5	0.5	24.0	0.5
COLOR	4600.0	4100.0	4600.0	2695.0	3600.0	3100.0
PH	9.5	8.4	9.0	8.4	8.0	7.9
NITROGEN	23.6		13.9			
PHOSPHOR	11.2		9.9			
DO-CONT.						
SS-CONT.		1405.9				
VSS-CONT		791.8				1455.9
SET-BOD						869.9
SLUDGE-SETT		20.0	464.0	86.0	121.0	
						50.0

DAY 815 IN FILE RECORD 223 DATA FOR 3/26/70

	PF	TF1	TF2	AL	OD	CL2
				DELETE		
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	1.0		3.0	1.7	6.4	
TEMP - C	30.0	24.0	28.0	17.0	18.0	
BOD5	509.0	274.0	359.0	66.0		53.0
TS	2547.9	2238.0	2360.9	2378.9		2133.0
VTS	1211.7	1037.7	979.8	1116.9		864.9
SS	870.0	440.0	648.1	261.8	2648.0	580.1
VSS	487.9	259.9	360.0	209.9	1476.0	339.9
SETT SOL	0.0	1.0	1.0	0.3	18.0	0.8
COLOR	4600.0	3005.0	4600.0	2695.0	5900.0	2695.0
PH	9.3	8.7	9.0	8.3	8.0	8.1
NITROGEN	22.5			22.9		
PHOSPHOR	10.8			6.9		
DO-CONT.		0.4		1.7	6.4	
SS-CONT.		1969.9				
VSS-CONT		1039.7				1055.9
SET-BOD						619.7
SLUDGE-SETT		20.0	404.0	59.0	53.0	
						30.0

DAY 816 IN FILE RECORD 224 DATA FOR 3/27/70

	PF	TF1	TF2	AL	OD	CL2
		DELETE		DELETE	DELETE	DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	1.1		4.8	1.2	7.7	
TEMP - C	28.0	25.0	28.0	16.0	17.0	
BOD5	599.0	225.0	228.0	70.0		76.0
TS	2338.8	2373.0	2366.0	2105.1		2109.0
VTS	965.7	957.7	1024.8	811.9		969.9
SS	288.0	599.9	584.1	532.2	5759.8	352.1
VSS	255.7	507.7	367.9	419.8	3159.2	320.4
SETT SOL	0.5	2.0	1.5	0.0	330.0	0.0
COLOR	4100.0	3600.0	3500.0	2910.0	6000.0	3200.0
PH	9.2	8.4	8.6	8.0	7.8	7.9
NITROGEN	22.5					6.5
PHOSPHOR	13.1					7.6
DO-CONT.		1.1		1.2	7.7	
SS-CONT.		1264.0				
VSS-CONT		811.7				1271.9
SET-BOD						848.2
SLUDGE-SETT		15.0	245.0	78.0	76.0	
						25.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAC-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 819 IN FILE RECORD 225 DATA FOR 3/30/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.5		6.2	1.7	7.8	
TEMP - C	31.0	23.0	27.0	17.0	17.0	
BOD5	614.0	264.0	255.0	85.0		84.0
TS	2369.9	2369.9	2342.0	2100.0		1997.9
VTS	1004.8	1020.0	986.9	837.9		755.8
SS	564.5	560.3	544.4	244.1	1291.5	2219.8
VSS	364.3	391.8	364.3		799.4	235.5
SETT SOL	0.5	1.5	2.0	0.0	40.0	0.0
COLOR	3980.0	3720.0	4250.0	2695.0	3100.0	3100.0
PH	9.3	8.4	8.7	7.7	8.2	8.2
NITROGEN	28.4	17.8				
PHOSPHOR	6.4	5.7				
DO-CONT.		0.3		1.8	7.7	
SS-CONT.		80911.9				1492.3
VSS-CONT						820.1
SET-BOD			247.0	70.0	84.0	
SLUDGE-SETT		35.0				45.0

DAY 821 IN FILE RECORD 226 DATA FOR 4/ 1/70

	PF	TF1 DELETE	TF2	AL DELETE	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	1.0		5.2	1.2	7.9	
TEMP - C	31.0	25.0	28.0	17.0	19.0	
BOD5	703.0	333.0	358.0	70.0		111.0
TS	2664.0	2541.9	2458.0	2290.9		2129.9
VTS	1326.9	1159.8	1189.9	1071.7		917.8
SS	664.0	655.5	523.6	91.5	679.9	291.7
VSS	324.0	171.4	251.4	67.7	267.8	147.6
SETT SOL	0.1	2.0	1.2	0.1	12.0	0.1
COLOR	4250.0	4100.0	4250.0	2910.0	3500.0	2910.0
PH	9.4	8.4	8.9	8.4	8.1	7.8
NITROGEN	29.9		16.9			
PHOSPHOR	7.2		6.6			
DO-CONT.		0.5		1.2	8.0	
SS-CONT.		1119.9				2319.9
VSS-CONT		607.8				931.9
SET-BOD			367.0	79.0	111.0	
SLUDGE-SETT		20.0				60.0

DAY 822 IN FILE RECORD 227 DATA FOR 4/ 2/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.						
TEMP - C						
BOD5	361.0		314.0	49.0		88.0
TS	2238.9	2295.0	2174.9	1943.0		1952.9
VTS	1025.8	1091.9	1014.8	798.0		744.8
SS	548.0	568.2	608.5	216.0	744.0	208.1
VSS	259.9	400.3	375.9		615.8	
SETT SOL	0.5	4.5	2.5	0.0	18.0	0.0
COLOR	3850.0	3500.0	3750.0	2200.0	2850.0	2850.0
PH	9.3	8.2	8.5	7.9	7.7	7.7
NITROGEN	59.2			18.7		
PHOSPHOR	26.1			6.0		
DO-CONT.						
SS-CONT.		21664.4				4400.0
VSS-CONT		6007.5				2387.4
SET-BOD			299.0	47.0	88.0	
SLUDGE-SETT		200.0				100.0

DAY 833 IN FILE RECORD 228 DATA FOR 4/13/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.						
TEMP - C						
BOD5	435.0	244.0	304.0	40.0		123.0
TS	2648.0	2345.1	2467.0	1893.0		1791.0
VTS	1108.9	868.8	949.8	614.8		589.9
SS	648.1	499.8	932.0	172.1	844.1	319.8
VSS	407.7	320.4	751.9		507.7	219.7
SETT SOL	0.5	2.5	1.5	0.2	25.0	4.5
COLOR	4250.0	3400.0	2780.0	2150.0	3005.0	2480.0
PH	9.2	8.1	8.6	8.0	7.8	7.7
NITROGEN	27.0	9.9				
PHOSPHOR	9.9	7.3				
DO-CONT.						
SS-CONT.		1779.7				560.3
VSS-CONT						212.3
SET-BOD			338.0	16.0	123.0	
SLUDGE-SETT		20.0				20.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 835 IN FILE RECORD 229 DATA FOR 4/15/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	4.0		4.5	2.7	6.8	
TEMP - C	31.0	27.0	27.0	20.0	20.0	
BOD5	854.0	284.0	389.0	73.0		125.0
TS	2380.0	2436.9	2154.9	2129.9		2050.0
VTS	1120.0	995.0	993.0	852.8		377.8
SS	599.9	572.5	380.2	283.8	1903.6	339.9
VSS	291.7	328.3	192.2	203.8	1023.4	192.2
SETT SOL	3.5	3.1	1.2	0.1	80.0	3.5
COLOR	4100.0	3980.0	3005.0	2600.0	8500.0	3200.0
PH	9.3	8.3	8.6	7.8	7.6	7.9
NITROGEN	5.3		17.9			
PHOSPHOR	10.7		9.6			
DO-CONT.		0.6		2.7	6.9	
SS-CONT.		2955.9				787.9
VSS-CONT		1439.5				436.3
SET-BOD			358.0		125.0	
SLUDGE-SETT		30.0				20.0

DAY 836 IN FILE RECORD 230 DATA FOR 4/16/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	4.0		4.1	1.1	7.7	
TEMP - C	31.0	28.0	29.0	20.0	21.0	
BOD5	644.0	290.0	704.0	63.0		230.0
TS	2669.9	1651.9	2579.9	2023.0		2023.0
VTS	1210.8	125.8	1129.7	761.0		751.9
SS	488.2		296.0	280.1	1543.5	440.0
VSS	356.4		167.8	236.1	988.0	
SETT SOL	0.5	2.2	1.3	0.1	85.0	5.1
COLOR	5000.0	3600.0	4600.0	2780.0	3850.0	3500.0
PH	9.3	8.3	8.7	8.1	7.8	7.7
NITROGEN	22.0			29.2		
PHOSPHOR	8.9			7.4		
DO-CONT.		0.6		1.1	7.7	
SS-CONT.		2488.4				829.3
VSS-CONT		1399.9				927.9
SET-BOD			434.0	79.0	230.0	
SLUDGE-SETT		25.0				20.0

DAY 837 IN FILE RECORD 231 DATA FOR 4/17/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.2		4.8	0.2	3.7	
TEMP - C	37.0	30.0	33.0	21.0	23.0	
BOD5	674.0	324.0	389.0	140.0		113.0
TS	2796.9	2835.9	2687.9	2115.9		2108.9
VTS	1300.0	1325.8	1196.6	771.8		846.7
SS	552.3	739.7	599.9	288.0	1768.1	252.0
VSS	380.1	468.1	387.5	236.1	988.0	172.1
SETT SOL	0.2	7.0	1.5	0.4	98.0	4.0
COLOR	5180.0	4100.0	4310.0	3100.0	4250.0	3720.0
PH	9.5	8.1	8.7	8.0	7.6	7.7
NITROGEN	19.7					1.5
PHOSPHOR	9.3					6.6
DO-CONT.		0.6		0.2	4.0	
SS-CONT.		1311.6				4487.9
VSS-CONT		779.3				2415.3
SET-BOD			419.0	74.0	113.0	
SLUDGE-SETT		10.0				180.0

DAY 840 IN FILE RECORD 232 DATA FOR 4/20/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.2		5.2	0.4	4.9	
TEMP - C	34.0	27.0	32.0	21.0	21.0	
BOD5	734.0	314.0	387.0	132.0		78.0
TS	2613.0	2203.9	2399.9	2245.0		2188.1
VTS	1261.8	984.7	1130.8	953.9		904.7
SS	452.2	476.0	440.0	596.3	3592.5	328.3
VSS	203.8	280.1	208.1	360.0	1874.0	160.5
SETT SOL	0.5	2.5	0.5	0.0	80.0	0.2
COLOR	5180.0	3850.0	4600.0	3720.0	14100.0	4600.0
PH	9.3	8.0	8.6	7.8	7.7	7.7
NITROGEN	1.6	2.1				
PHOSPHOR	5.2	3.9				
DO-CONT.		0.6		0.4	5.0	
SS-CONT.		1548.4				6027.8
VSS-CONT		728.0				3147.7
SET-BOD			434.0	138.0	78.0	
SLUDGE-SETT		10.0				300.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 842 IN FILE RECORD 233 DATA FOR 4/22/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.8		4.8	0.4	5.3	
TEMP - C	33.0	28.0	29.0	21.0	21.0	
BOD5	497.0	244.0	359.0	112.0		52.0
TS	2534.9	2401.8	2584.0	2257.0		1841.8
VTS	1169.8	961.7	1026.9	924.9		689.9
SS	488.2	332.0	404.0	455.9	4440.3	223.9
VSS	295.9		283.8	395.4	2336.0	164.1
SETT SOL	0.2	1.6	1.0	0.3	150.0	0.0
COLOR	3600.0	3850.0	3600.0	3200.0	18200.0	3400.0
PH	9.0	8.1	8.6	7.9	7.7	7.7
NITROGEN	18.8		18.1			
PHOSPHOR	7.9		6.0			
DO-CONT.		0.6		0.4	5.4	
SS-CONT.		916.1				1304.3
VSS-CONT		267.8				731.7
SET-BOD			346.0	109.0	52.0	
SLUDGE-SETT		10.0				70.0

DAY 843 IN FILE RECORD 234 DATA FOR 4/23/70

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.1		3.2	0.3	3.9	
TEMP - C	33.0	31.0	31.0	22.0	22.0	
BOD5	529.0	235.0	345.0	102.0		50.0
TS	2883.9	2594.9	2671.0	2451.0		2043.1
VTS	1442.8	1215.7	1233.7	1074.0		873.8
SS	540.1	548.0	599.9	559.6	195.9	248.4
VSS	380.2	380.2	404.0	415.6		
SETT SOL	1.0	2.7	3.1	1.5	4.0	2.5
COLOR	5180.0	3300.0	3005.0	2910.0	3005.0	2850.0
PH	8.7	8.0	8.2	7.6	7.5	7.4
NITROGEN	11.4			29.8		
PHOSPHOR	9.4			8.2		
DO-CONT.		0.6		0.4	4.0	
SS-CONT.		2348.0				
VSS-CONT		1363.9				
SET-BOD			318.0	78.0	58.0	
SLUDGE-SETT		10.0				

DAY 844 IN FILE RECORD 235 DATA FOR 4/24/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.3		5.2	0.5	3.8	
TEMP - C	32.0	27.0	28.0	22.0	22.0	
BOD5	614.0	324.0	434.0	126.0		59.0
TS	2624.0	2357.9	2559.9	2327.8		1994.0
VTS	1360.8	1047.8	1212.9	1096.8		741.7
SS	664.0	535.8	892.3	608.5	1159.6	364.3
VSS	483.9	271.5	591.9	392.4	799.4	172.0
SETT SOL	0.5	2.7	3.5	0.5	63.0	0.6
COLOR	4310.0	3600.0	3500.0	3300.0	3850.0	3500.0
PH	8.6	7.6	8.0	7.6	7.3	7.5
NITROGEN	1.3					1.0
PHOSPHOR	9.4					6.1
DO-CONT.		0.6		0.5	3.9	
SS-CONT.		535.8				3376.4
VSS-CONT						1944.5
SET-BOD			259.0	86.0	59.0	
SLUDGE-SETT		20.0				140.0

DAY 847 IN FILE RECORD 236 DATA FOR 4/27/70

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.2		5.0	0.4	3.8	
TEMP - C	35.0	32.0	33.0	23.0	23.0	
BOD5	570.0	285.0	450.0	139.0		91.0
TS	2709.9	2513.1	2610.0	2581.9		2071.9
VTS	1443.8	1126.8	1196.6	1071.7		920.9
SS	552.3	563.9	708.0	1096.1	248.4	260.0
VSS	352.1	363.7	488.2	668.2		244.1
SETT SOL	0.6	3.0	3.5	5.5	5.0	3.0
COLOR	4600.0	4100.0	4150.0	4200.0	3400.0	3720.0
PH	8.9	8.0	8.0	7.7	7.6	7.5
NITROGEN						
PHOSPHOR						
DO-CONT.		0.6		0.4	3.9	
SS-CONT.		6135.8				6079.7
VSS-CONT		3279.6				3199.7
SET-BOD			362.0	97.0	91.0	
SLUDGE-SETT		20.0				90.0

LISTING OF INDIVIDUAL DATA BY DATE WITH EDITED DELETIONS INDICATED
(MEAD-FWQA PROJECT ON BIOLOGICAL TREATMENT)

DAY 849 IN FILE RECORD 237 DATA FOR 4/29/70

	PF	TF1	TF2	AL DELETE	OD	CL2
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.				0.4		
TEMP - C				24.0		
BOD5	824.0	244.0	464.0	108.0		45.0
TS	2547.9	2415.0	2608.0	2203.9		
VTS	1210.0	1176.8	1191.8	888.8		
SS	79.9	280.1	671.9	360.1	1471.5	
VSS	40.2	263.6	528.5	231.9	852.0	
SETT SOL	0.1	2.5	4.0	0.7	80.0	0.2
COLOR	4600.0	3720.0	4310.0	3500.0	9500.0	3500.0
PH	9.5	8.3	8.6	8.0	7.9	7.6
NITROGEN						
PHOSPHOR						
DO-CONT.				0.4		
SS-CONT.		1004.0				911.8
VSS-CONT		595.6				579.7
SET-BOD			449.0	96.0	45.0	
SLUDGE-SETT		20.0				30.0

DAY 850 IN FILE RECORD 238 DATA FOR 4/30/70

	PF	TF1	TF2 DELETE	AL	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.1		4.0	0.4	3.5	
TEMP - C	36.0	34.0	35.0	24.0	23.0	
BOD5	659.0	239.0	382.0	101.0		47.0
TS	2454.9	2346.9	2622.9	2376.8		2108.0
VTS	1207.8	1073.9	1265.8	1107.6		883.8
SS		552.3		440.0	3684.0	303.9
VSS		455.9			2083.7	255.7
SETT SOL	0.5	4.0	5.0	1.0	70.0	0.4
COLOR	5180.0	2780.0	3300.0	3100.0	4310.0	3100.0
PH	9.2	8.2	8.4	8.0	7.9	7.9
NITROGEN						
PHOSPHOR						
DO-CONT.		0.6		0.4	3.7	
SS-CONT.		5351.5				971.6
VSS-CONT		2907.5				651.7
SET-BOD			532.0	123.0	47.0	
SLUDGE-SETT		40.0				30.0

DAY 851 IN FILE RECORD 239 DATA FOR 5/ 1/70

	PF	TF1	TF2	AL	OD DELETE	CL2 DELETE
FEED-GPM		33.3	33.3	16.0	33.3	33.3
DEPTH-FT		24.0	24.0	7.7	4.3	
RECY-GPM		33.3	33.3		30.0	
D.O.	0.2		5.1	0.4	3.4	
TEMP - C	37.0	35.0	36.0	25.0	28.0	
BOD5	570.0	244.0	360.0	109.0		27.0
TS	2716.9	2512.9	2839.9	2540.8		1941.9
VTS	1357.9	1158.9	1359.7	1053.7		777.9
SS	507.8	512.0	620.1		1528.3	103.7
VSS	368.0	391.7	387.5		764.1	56.1
SETT SOL	0.5	3.0	7.2	4.0	65.0	0.0
COLOR	4100.0	3500.0	3550.0	3400.0	3980.0	2550.0
PH	9.3	8.4	8.4	8.0	7.9	7.9
NITROGEN						
PHOSPHOR						
DO-CONT.		2.6		0.4	3.4	
SS-CONT.		1500.2				708.0
VSS-CONT		831.8				236.1
SET-BOD			313.0	103.0	27.0	
SLUDGE-SETT		20.0				20.0

N04 READY READER

1 Accession Number	2 Subject Field & Group	SELECTED WATER RESOURCES ABSTRACTS INPUT TRANSACTION FORM
W		

5 Organization

The Mead Corporation, Central Research Laboratories

6 Title

Multi-System Biological Treatment of Bleached Kraft Effluents

10 Author(s)

16 Project Designation

12040 EMY

21 Note

22 Citation

23 Descriptors (Starred First)

Trickling Filters, Aerated Lagoon, Oxidation Ditch, Sludge Return, BOD Removal, Pulp and Paper Industry

25 Identifiers (Starred First)

27 Abstract A multi-unit pilot plant was used to study the biological treatment of integrated kraft pulp and paper effluents after conventional primary clarification. The biological units included two high-rate trickling filters packed with PVC media, an oxidation ditch with brush-type aeration, and a lined earthen lagoon with mechanical surface aeration. Simultaneous series and parallel operation of the four biological systems was possible. The combinations using normal strength effluent included: (a) Trickling filters in series, (b) Trickling filter to aerated lagoon, (c) Oxidation ditch to aerated lagoon, and (d) Oxidation ditch to trickling filter. Black liquor was added to the clarified effluent in order to elevate the BOD_5 level and the following combinations were tested: (a) Trickling filter to oxidation ditch to trickling filter, (b) Trickling filter to aerated lagoon, and (c) Trickling filters in series followed by oxidation ditch. The best efficiencies were obtained on the pilot oxidation ditch when it was run with clarification and sludge return as the extended aeration process. BOD_5 removals as high as 94 percent were obtained. The trickling filter with sludge recycle performed better than the conventional trickling filter. BOD_5 removals of 60 to 70 percent were obtained. This report was submitted in fulfillment of Grant No. WPRD-55 (12040-EMY) between the Environmental Protection Agency and The Mead Corporation.

Abstractor Karl Ayers | Institution The Mead Corporation

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